NAVY CIVIL Engineer

Summer 1988

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Cover

Sophia Ashley, award-winning physicist and mechanical engineer, is featured on this issue's cover. In the article inside, the author Lallie P. Dawson, tells how Ashley got her desire for learning and how she developed from her beginnings in Greece to being chosen Federal Engineer of the Year in 1985.

NAVY CIVIL Engineer

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MAJOR THEME — ACQUISITION AND PROCUREMENT

Magazine Production Schedule

ISSUE	THEME*	MATERIAL DUE	DISTRIBUTION DATE
FALL 1986	Seabees	July 15, 1986	Oct. 1-15, 1986
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SPRING 1987	Military Personnel	Jan. 15, 1987	April 1-15, 1987
SUMMER 1987	History (CEC-Seabees)	April 15, 1987	July 1-15, 1987

*It is hoped to have several articles in each issue on the major theme, but no issue will be made up only of theme articles. All subject matter is welcome and will be considered for publication.

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LANDSLIDE

What do you do when 30,000 cubic yards of soil and debris come sliding down?

By LT. SCOTT A. MORRIS, CEC, USNR
Staff Civil Engineer,
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Subic Bay, Republic of the Philippines

Early in the morning of June 28, 1985, a major landslide occurred on the jungle-covered slopes of the Fuel Farm at the Naval Supply Depot, Subic Bay, Republic of the Philippines. Twenty-eight consecutive days of heavy rains, topped off by a record 30-inch rainfall in 48 hours caused the slide which took with it 30,000 cubic yards of soil, jungle vegetation and 200 feet of six-inch waterline.

An eight-foot-high pile of earth, trees and bamboo blocked the only access road to the Fuel Farm. To compound problems, the broken waterline quickly emptied a 110,000-gallon firefighting water tank. The most significant damage from the slide was yet to be discovered. Through the mud and water, approximately 150 feet of a 22-inch diameter jet fuel pipeline was found dangling 30 feet in the air, spanning the void created by the landslide.

The Public Works Center (PWC) immediately responded to this emergency situation. A D9 bulldozer was used to remove the eight-foot-high mound of debris which blocked the only access road to the Fuel Farm. The entire effort was accomplished during torrential rains within only five hours.

With immediate repairs out of the way and assurance the fuel pipeline was in no danger of collapsing, temporary repairs were undertaken to reduce the possibility of additional hillside erosion during the remaining three months of rainy season.

All vegetation and debris were removed from adjacent runoff ditches. A diversion berm of sand bags was constructed above the slide area to divert water runoff from the slide face. The six-inch waterline was replaced by laying 500 feet of pipe up a steep jungle-covered slope. Pipe sections were manhandled up the slope and water supply to the fire protection system was restored.

The Naval Supply Depot Fuel Farm is a massive 2.5 million-barrel complex which was built in the mid-1960s as the Seventh Fleet stock point for jet and diesel fuel storage and contingency war reserves. The farm contains 68 fuel tanks most of which are underground 80,000 barrel concrete tanks.

During the Vietnam War, the Supply Depot was pumping out over seven million barrels per month. Construction of the farm along the mountain side was required due to a lack of flat terrain in the Subic Bay area. The 22-inch fuel line is extremely critical because it is the supply line for two 80,000-barrel JP-4 storage tanks at Subic Bay from which NSD supplies fuel to fighter aircraft at Clark Air Base some 50 miles to the north.

In addition to crippling NSD's JP-4 storage capability, a failure in this pipeline will result in a highly volatile fuel spill into the Boton river at the bottom of the slide.

An analysis of the slide by PWC, Commander, Pacific Division, Naval Facilities Engineering Command (PACNAVFACENGCOM) and a geotechnical consultant revealed a downward sloping layer of bedrock a few feet below the surface created an impervious zone which was the primary factor resulting in the failure of the slope.

The soil above this impervious zone became super saturated as a result of the record precipitation. At this point, the additional weight of the saturated soil probably caused a slight slide down the bedrock plane and severed the six-inch underground waterline.

Poor drainage at the site due to vegetation growth in the drainage ditches adjacent to the slide area contributed to the problem. A broken portion of a concrete drainage ditch at a critical bend in the ditch resulted in considerable runoff escaping from the ditch at this point through an earthen hole caused by high velocity water flow.

The additional injection of fluid and weight as a result of the severed waterline and damaged runoff ditch caused the total collapse of the hillside.

The problem of the suspended 22-inch JP-4 fuel line was the next area of attention. The exposed fuel line was to be temporarily supported pending permanent repairs. PWC designed and

constructed a metal support in mid-span for the fuel line. The entire structure and foundation was transported, positioned and erected by hand.

The slide area was only safely accessible from the road at the bottom of the slide. All the tools, concrete and metal structure were hauled up the steep, debris-laden washout of the landslide. Despite these problems, the temporary support structure was completed on time and without any accidents.

Permanent repairs were next on the agenda. Rapid approval and funding for the major repair efforts was provided by Commander in Chief, U.S. Pacific Fleet (CINCPACFLT).

Alternative solutions were to leave the 22-inch pipe in place and rebuild the hillside around it or relocate the 22-inch line away from the slide.

The high cost of placing select fill in a terraced fashion around the line caused the relocation option to be selected. Relocation of the line will require 500-feet of new pipe and is expected to be completed this winter. OICC SOWESTPAC is presently working on the design.

Looking back on this major loss, we derived several useful tips which might help eliminate or at least minimize the damage of a landslide. First, ensure all drainage systems are cleaned out and free of obstructions. Periodic scheduled inspections of critical areas will pay off. Secondly, identify all potential landslide areas.

PACNAVFACENGCOM has provided geotechnical assistance to identify high risk slide areas. This information was useful in establishing roving patrols in the high risk areas in the Subic Bay area. Areas requiring landslide prevention actions have also been identified.

Lastly, qualified personnel must be available to provide emergency actions when this type of disaster occurs. In the case of fuel farms, an operator needs to be available to shut off fuel and water valves in the event of a pipeline break.

There is no absolute protection from natural disasters, but the negative effects of such a loss can be minimized with common sense practices. For NSD Subic Bay, all the actions and precautions will continue to be tested in upcoming rainy seasons. □

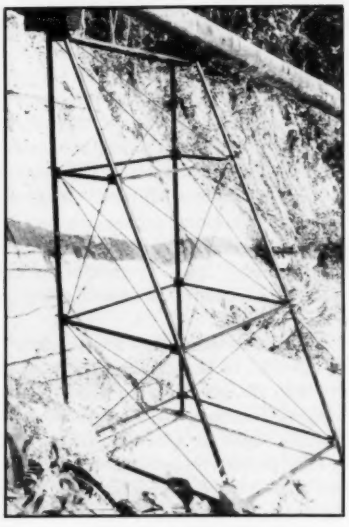
Tons of debris

Pipeline exposed

The negative effects of disaster can be minimized

Berm construction

Ditches cleaned



Temporary structure

Quality assurance control: a continuous effort for the responsible engineer

By SYDNEY H. STILLEY
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Much has been written on civil engineering quality assurance and quality control. The emphasis here is the conception that civil engineering quality is built in when quality control management provides progressively, continuous quality coordination, checking and assurance throughout the engineering process — beginning with the development of the design and continuing on through construction services and completion of the project.

In the fall of 1985 at Purdue University, as a part of the National Society of Professional Engineers' 50th Anniversary Year, the new chairman of Professional Engineers in Private Practice (PEPP), James A. Rhyne, P. E., stated that quality in professionalism includes the protection of the health, safety and welfare of the public by quality engineering. Quality engineering is the goal of civil engineers.

The responsibility of engineers for quality engineering is addressed by the Florida Board of Professional Engineers in its Newsletter of June 1985. It reported that a new committee was formed to define the responsibility of engineers, particularly in regard to structural failures. The objective of the committee is to write a rule defining the term "engineering responsibility." Professional engineers accept engineering responsibility with the use of quality assurance and quality control, and with involvement throughout a project from beginning to the very end.

The engineer's first step should be to set up an ongoing project record system. In an American Society of Civil Engineers (ASCE) sponsored workshop held in St. Louis in late 1983, engineers reported benefits from the use of computers for a project record. When a project is entered into a computerized system, overall progress reporting and continuous quality checking is provided.

The engineer is assured that the latest information is available for use when data are stored and kept current in a single digital base system. This system enables an engineer to have available at all times an up-to-date reference.

Quality checking procedures should be developed that include the conceptual studies, design process plans and specifications, list of contractor submittals, cost estimate, construction contract documents, and program for construction inspection.

Monitoring for quality assurance by calling up those data on the CRT screen is faster and more efficient than reviewing with the usual design office procedures. The ongoing computer record provides a framework with milestones at specific stages for quality checking and analysis.

This project record can be used as a checklist by all parties to the process for assuring that the completed building meets all applicable codes and quality standards. The responsibility for quality checking should include the basic design, structural details and connections, review of shop drawings, field supervision, and verification of structural safety-related matters.

It is important at the inception of the design to properly coordinate the structural system layout with the architect. The structural system and materials selected should be suitable and capable of carrying the required loads, be compatible with fire protection requirements, and comply with architectural and functional concepts.

The architect's conceptual drawings must take into account the distribution of lateral forces and load-resistant elements that are critical for dynamic and static loads. Provisions must include loads from utility systems, such as ventilation, heating and air-conditioning, water supply, waste systems, electrical system, etc.

In choosing structural materials for a project, consideration should be given to:

- The site environment, including climate, subsurface conditions and wind velocity
- The skill and experience of prospective contractors
- The design life of the facility and maintenance costs over this period
- The experience of design and inspection personnel
- The availability of labor and materials
- The feasibility of preassembling or precasting major structural elements

Design methods and stress allowances for selected structural materials should be in accordance with current codes and specifications. Where the structural system cannot be analyzed on a rational basis, the acceptability of the load-carrying capacity of the system should be determined by suitable load or model tests.

Structures to be built in tornado and hurricane areas should be designed so that structural integrity and continuity are provided from foundation to roof, irrespective of the materials selected for the facility.

All components of the structure must be positively tied together in order to establish an overall integrated resistance to high wind effects. In designing drag-sensitive structures such as stacks, guyed towers, and suspended frames, pulsating forces must be considered in addition to the effect of maximum wind forces.

The civil engineer gains quality control with the use of professionals within his own field of competence. An engineer may retain specialized consultants to supplement his own capabilities, either to take advantage of specialized knowledge or experience, or for an independent check on his own analysis and calculations.

The military view on quality engineering was expressed about four years ago when Congress and the Secretary of Defense mandated that military projects should be designed, bid, and constructed of utmost quality. Design quality would not be sacrificed for speed. A requirement to meet schedules

would not override the necessity for adequate quality control. The engineering profession is under pressure to meet agreed schedules and provide quality engineering.

The engineer is held responsible for the quality of designs, drawings, specifications, cost estimates, and other services furnished under the contract. The engineer is required, without additional compensation, to correct or revise any error or deficiency in the work, and to remain liable to the government in accordance with applicable law for all damages caused by negligent performance.

An incident which resulted in the collapse of a building required that the structural engineer's license be revoked. Fortunately, there were no lives lost or injuries but property damage was great. The engineer was found guilty of negligence and incompetence, and misconduct in the practice of engineering.

It happened that the steel fabricator's shop drawings were reviewed by an inexperienced technician employed by the contractor. Essentially, the check was only for dimensions and fit without regard for the required sectional modulus of the structural members and proper connections designed by the engineer.

The civil engineer gains quality control with the use of professionals

The engineer thoughtlessly gave his approval of the completed building without actually making a field inspection. He was guilty of accepting the word of the contractor and fabricator that the construction complied with his plans and specifications; the engineer shared the liability of the loss with the contractor.

This incidence is mentioned to show directly that the lack of quality engineering in review of shop drawings and field inspection brings failure often at great costs to society in lives, injuries and property damage. The cost to the engineering profession is also signficant in damage to reputations.

In 1981, the concrete structure of a condominium in Cocoa Beach collapsed, killing several people. In the wake of this tragedy, a study committee was created by the 1982 legislature. The cause of the failure seemed to have been related to the design of the concrete slabs.

The slab design thickness was less than required by the American Concrete Institute (ACI 318) Code, and the slab's carrying capacity was reduced further by careless approval of shop drawings that provided undersized reinforcing steel-bar chairs. A quality check of the design and shop drawings for the structural floor system probably would have prevented this failure and saved lives.

The study committee found that many highly speculative projects were initiated with a minimum of design documents, only sufficient for obtaining a building permit. Action was taken. Now, building officials are required to screen projects to insure that structural aspects of projects are designed and sealed by a qualified structural engineer before building permit is issued.

The Florida Board of Professional Engineers established quality controls for engineering documents by amendments to the National Society of Professional Engineers (NSPE) Code of Ethics. There are two important areas covered: the first of these states that an engineer is prohibited from signing and sealing documents that were not prepared by him or under his responsible supervision, direction or control. (Previously, the NSPE Code had allowed considerably broader signing powers.)

Another amendment states that an engineer may accept assignments and assume responsibility for coordination of an entire project and sign and seal the engineering documents for the project, provided that each technical segment is signed and sealed by the qualified engineer who prepared the segment.

In addition, the State of Florida has taken action for quality engineering by requiring that a special inspector be on the construction site of any threshold building more than three stories, or 50 feet in height, or which has a public meeting area larger than 5,000 square feet. The special inspector shall be on the site during the construction of all structural elements of threshold buildings.

Construction administration, with quality control by the design firm, should include continuous on-site inspection during all phases of construction with one or more competent, technically qualified and experienced inspectors, even though the building does not fall under the threshold classification.

It is the responsibility of the inspector to see that construction is in strict accordance with the contract requirements including all detail of the engineer's specifications, plans, and approved contractor's submittals — shop drawings, placing and erection drawings and such documents.

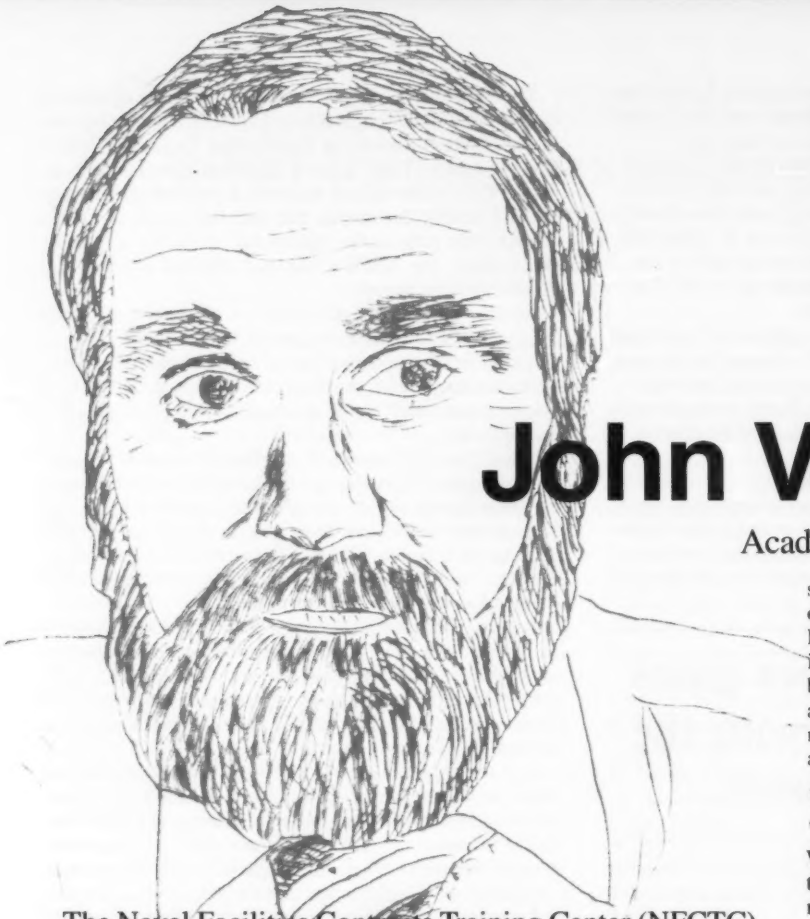
In addition, the inspector must see that all workmanship and construction practices are equal to or in excess of the standards called for in the contract documents.

Under the provisions of construction contracts of many federal agencies, in particular the Corps of Engineers, Naval Facilities Engineering Command, National Aeronautics and Space Administration, and others, an inspection concept known as "contractor quality control (CQC)" is implemented.

Under this system, the contractor must organize and maintain and inspection system within his own organization to assure that the work performed by his own or his subcontractors' forces conforms to contract requirements, and to make available to the government adequate records of such inspection.

Under the majority of contractor quality control plans, a government representative also is stationed on the construction site for quality assurance inspections. In all cases, the design firm should be engaged to provide quality assurance inspection in addition to the contractor quality control.

Engineering quality assurance and quality control are shown to be essential for quality engineering and engineering responsibility. Quality control management is not merely a quality check of the completed contract document, but a continuous quality assurance effort throughout the design and construction of the project. Quality engineering and engineering responsibility are regulated by the Board of Professional Engineers, the National Society of Professional Engineers (NSPE), American Society of Civil Engineers (ASCE) and other professional organizations. □



Q&A

The NCE Magazine talks with

John Verardo

Academic Director, NFCTC

The Naval Facilities Contracts Training Center (NFCTC) was established to serve the Naval Facilities Engineering Command (NAVFAC) in training and educating the work force in the acquisition and contracting management areas. Open for business in October 1985, NFCTC has been embarking on a program of developing and presenting courses of instruction. These courses of instruction will provide the necessary training to the NAVFAC professionals.

The man responsible for the academic integrity of the courses at NFCTC, Mr. John E. Verardo, Jr., arrived at Port Hueneme in August 1985. His comments and observations of the efforts to date are revealed in this interview.

Mr. Verardo, how is NFCTC doing these days?

To date, I can honestly say we are proceeding along quite well. Our courses are set, lesson plans developed and instruction is in process.

What is your impression of the area of Port Hueneme?

The location of the NFCTC at Port Hueneme seems to be excellent. Being co-located with CECOS* has afforded us the opportunity to utilize and share some of the outstanding talents of that organization. In fact, our director of NFCTC also serves as the commanding officer of CECOS. In addition, being on an active base rather than in an office building reinforces the ultimate mission orientation of NAVFAC and NFCTC.

**Naval School, Civil Engineer Corps Officers*

What were some of your previous experiences in the education world?

Well, I just completed eight years at the U.S. Air Force Institute of Technology, serving as instructor and course director of contracting management courses. Teaching and working in the contract administration area has provided me an opportunity to realize the impact of the various congressional programs aimed at improving the contracting process. As the course director of the AFIT Advanced Contract Administration course, I was fortunate in providing education and training to the contracting offices and contract specialists of some major DOD programs, including some major NAVFAC projects.

How do you see the NFCTC courses matching up to other service school courses?

The NFCTC courses have been developed in a professional manner and should be received quite well by the students. The reason for that confidence is due to a number of factors. First is the talent of our instructors. Each instructor brings a special talent

to the classroom. NFCTC has a full range of contract management experience and expertise. That, coupled with a commitment to present in a professional manner current and timely topics of contract management enables me to confidently say I believe our faculty communicates those good words effectively.

Secondly, those same instructors have made the commitment to develop and document effective lesson plans and lesson objectives. These lessons have been developed to relate to the continuing education needs of the professionals of NAVFAC.

Our courses will be in three-day, one-week, and two-week versions initially. Future course development will be determined based upon needs of the field.

Will there be a grading program used in the courses?

We are making a commitment to our students. The extensive preparation by the instructors, the presentation by the instructors, managers, and supervisors sponsoring their employees to attend the courses, and the fact that the employees are putting forth the effort in the classes illustrates the fact that all parties are in this together.

Consistent with a sound academic program, we do in fact have a grading program that will enable the students to document their accomplishments as well as point out any deficiencies in a particular topic area.

I might add, we have also established a remedial program enabling a student that does not initially pass a course, to have a restudy period and then petition for accomplishing the remedial program.

You talk a lot about commitment.

Commitment started from NAVFAC Headquarters (HQ). One of the most important aspects of any training activity is the commitment afforded that training action by higher management.

I was impressed with the strong, positive statements from NAVFAC HQ on the very establishment of the school and the determination to insure it was set up properly, and in an expeditious manner. Without that strong backing, we could not have done what we have accomplished, nor even plan on some future tasks. Regardless of the task, you must have full support from the top.

At our level in the center, the commitment to support our endeavors has been provided virtually on a daily basis. The Deputy Director, LCdr. Dave Gorden, is truly one of the founders of NFCTC. He was tasked with establishing the framework of the school, the initial offering of classes, and the initial staffing. Our Director, Captain Brian O'Connell, has afforded us the environment and resources to prepare and present these contracting classes. He has provided us the full support and encouragement necessary to enable this new organization to grow and develop.

What do you see as future NFCTC tasks?

Well, our initial task of assisting NAVFAC achieve a fully-trained procurement workforce by December 1987 represents the present and near-term future efforts. However, we are already starting to plan our long-term future efforts for the next phase of acquisition and contracting courses with a more specific orientation in a particular topic area. In addition, we plan to establish workshops on timely topics.

We have a grading program that will enable the students to document their accomplishments as well as point out deficiencies.

Any final thoughts?

I would like to thank those senior level NAVFAC managers who have assisted us in course development. A number of them have taken the time to provide us insight, input, and actual case examples for lesson-plan purposes. This action helps us and insures that they are part of the solution. I would offer to the entire NAVFAC community the opportunity to provide us their thoughts in the acquisition and contracting area.

I would also like to assure the field that we will provide to them the finest professional courses they can obtain and look forward to serving them now and in the future. □

REDICHECK Revisited

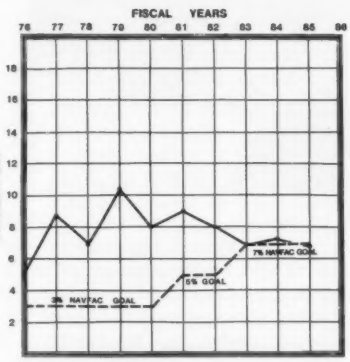
REDICHECK is unique because it encourages the reviewer to address the source of most design errors and omissions — the point of interface between one discipline and another.

By LCDR WILLIAM T. NIGRO
R. A., Florida
Course Director, Design Contract Management Course
Naval Facilities Contracts Training Center
Port Hueneme, Calif.

If all engineering field divisions (EFDs) were to use REDICHECK for all construction projects, it is conceivable that with a current $3 billion construction / year program, approximately two percent or $60 million in needless change orders/year could be avoided. Intangible REDICHECK savings include reduced time extension delays; administrative savings in the avoidance of preparing government estimates, negotiating, and processing change orders; and a reduction of expensive time consuming A/E liability cases.

"REDICHECK Promises to Minimize Waste" was published in the Winter 1983 issue of *The Navy Civil Engineer Magazine*. This article stated, "The REDICHECK method provides a logical and orderly approach to checking construction drawings and specifications and, if used, could eliminate errors and up to three percent of the total construction costs." In the three years since the article was published, REDICHECK's use and documentation of corresponding change order savings have developed more fully.

Is There a Change Order Problem?



Fiscal Year	Work In Place ($M)	Change Orders ($M)	C/O Percent
76	635.1	33.8	5.3
77	776.3	67.5	8.7
78	828.0	57.7	7.0
79	963.1	98.9	10.3
80	1,116.4	89.3	8.0
81	1,039.5	93.7	9.0
82	1,214.4	99.8	8.0
83	1,902.9	133.2	7.0
84	2,060.8	151.2	7.3
85	2,427.3	168.0	6.9

Note! All data appearing in this graph and in the following seven graphs are from the NAVFAC Goal Progress Reporting System.

Approximately 50 percent of all Naval Facilities Engineering Command (NAVFAC) change orders are due to needless coordination errors and omissions, with the rest primarily due to unforeseen or differing site conditions and changes in sponsor/user requirements. During the last nine fiscal years (FY-76 through FY-85) NAVFAC constructed approximately $13 billion in military construction (MILCON) and operation and maintenance contracts of which approximately $1 billion was change orders. This amounts to an average change order rate of 7.7 percent for the nine fiscal years. REDICHECK is a cost effective means of reducing needless change orders.

REDICHECK Defined

REDICHECK is a structured interdisciplinary review system which provides a systematic approach to finding coordination errors between disciplines in construction drawings and specifications at the 100 percent design stage. It is based on the sequence of construction and is most effective on vertical construction projects containing many disciplines.

The author describes his proprietary system for inter-disciplinary coordination of contract drawings, known as REDICHECK, which has been used extensively by NAVFACENGCOM field activities with the permission of the author. NAVFACENGCOM policy supports the use of a disciplined system, such as REDICHECK, for interdisciplinary coordination of drawings. Because there are many factors which impact upon contract change-order rates, it is difficult to estimate the cost impacts of design coordination reviews. The opinions expressed in the article on this point are those of the author.

What Makes REDICHECK Unique?

Most checklists are for single discipline reviews and aid in achieving quality documents within a discipline. This very often results in contract documents coordinated within a discipline but not between disciplines. REDICHECK, on the other hand is a multidiscipline checklist that is used between all disciplines to ensure that each discipline is coordinated with all other disciplines.

Typical errors uncovered by REDICHECK include mechanical ducts in the same locations as structural beams or architectural reflected ceiling plans that are at variance with items indicated on electrical and/or mechanical plans. REDICHECK is unique because it encourages the reviewer to address the source of most design errors and omissions — the point of interface between one discipline and another.

Change Order Savings in the Past 3 Years

The commands with the most active REDICHECK programs are experiencing the lowest change order rates. At OICC TRIDENT where REDICHECK has been utilized to the greatest extent, more than the three percent predicted construction cost reduction has been achieved every year since FY-82. There are however, several deductions that should be taken from the gross 3 percent construction cost savings. These include an equivalent of approximately 1 percent of offset costs composed of the cost of implementing REDI-CHECK, the costs of omissions not originally bid, and A/E liability recovery amounts.

NAVFAC Policy

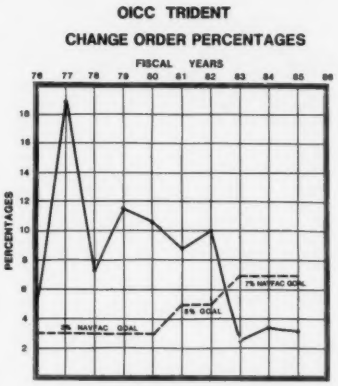
Commander NAVFAC letter of April 28, 1986, establishes and implements policy to improve the quality of contract plans and specifications produced under A/E contracts.

This includes starting with a quality control (QC) selection process dealing with the synopsis and criteria factors, requiring the A/E to do a QC check of the final submittal and command personnel to do a quality assurance review, identifying appropriate costs in the Government estimate for QC requirements, evaluating an A/E's QC procedures as part of A/E performance evaluations, and implementing a procedure to establish that the A/E has accomplished the required QC review.

The procedure (REDICHECK) taught in the NAVFAC Contracts Training Center Design Contract Management Course is recommended as an effective method of conducting interdisciplinary coordination checks either by in-house personnel or by an indefinite quantity (formerly called open-end) contract.

REDICHECK in the Field

At some time during the last three years each of the EFDs have developed quality improvement programs that utilize REDICHECK. Some of the EFDs such as OICC TRIDENT and PACDIV have had REDICHECK in place long enough to see reductions in change order rates. The other EFDs have implemented REDICHECK programs more recently and construction change order savings have not had time to be realized.



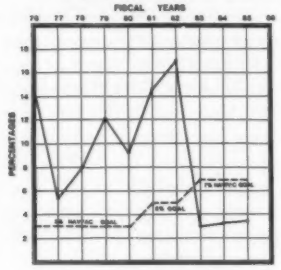
Officer in Charge of Construction TRIDENT (OICC TRIDENT), Kings Bay, Ga. — Since October 1981, twenty-nine major projects with an estimated construction cost in excess of $400 million have been REDICHECKed in-house or by the Title II contractor. Cost of the REDICHECK services has been approximately $500,000, 1/8 of 1 percent of the estimated construction cost.

Fiscal Year	Work In Place ($M)	Change Orders ($M)	C/O Percent
76	3.2	0.2	4.9
77	140.3	26.6	19.0
78	102.4	7.6	7.4
79	74.2	8.7	11.7
80	45.6	4.8	10.5
81	27.6	2.4	8.7
82	26.0	2.6	10.0
83	51.0	1.3	2.5
84	62.6	2.3	3.5
85	114.1	3.8	3.3

REDICHECK is most effective on vertical construction projects containing many disciplines.

PACDIV

CHANGE ORDER PERCENTAGES

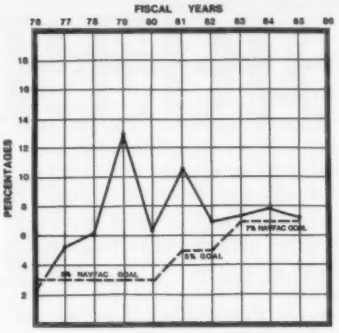


Fiscal Year	Work In Place ($M)	Change Orders ($M)	C/O Percent
76	83.8	12.3	14.7
77	75.3	4.2	5.6
78	112.2	8.5	8.0
79	138.4	16.7	12.1
80	132.3	12.5	9.4
81	126.0	18.4	14.6
82	165.2	28.3	17.0
83	372.4	11.0	3.0
84	377.4	11.9	3.2
85	408.1	14.5	3.6

Pacific Division (PACDIV), Pearl Harbor, Hawaii — REDICHECK or a similar formal design quality control system is required on all Architect/Engineer (A/E) design projects with an estimated construction cost above $2 million. The REDICHECK check-off list is in the PACDIV A/E Guide and is made part of the A/E's design contract scope of work. PACDIV has three maximum $99,000 indefinite quantity contracts to perform REDICHECK services. Thirty-two projects have been REDICHECKed to date at an average cost of $3,000 each.

SOUTHDIV

CHANGE ORDER PERCENTAGES

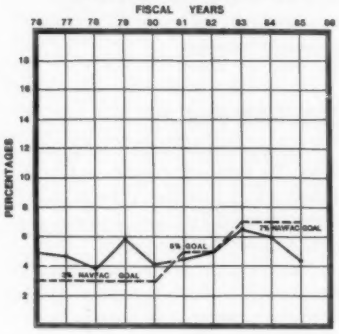


Fiscal Year	Work In Place ($M)	Change Orders ($M)	C/O Percent
76	208.1	4.8	2.3
77	109.5	5.9	5.4
78	106.4	6.6	6.2
79	133.2	17.3	13.0
80	140.7	8.9	6.3
81	121.8	12.8	10.5
82	144.8	10.1	7.0
83	230.4	17.1	7.4
84	233.2	18.4	7.9
85	302.4	21.7	7.2

Southern Division (SOUTHDIV), Charleston, S.C. — ALL SOUTHDIV Commerce Business Daily A/E design contract announcements contain as their third highest selection criteria item: "Quality assurance and bid document coordination methods you use during design." During the August-September 1985 time frame SOUTHDIV sponsored 14 one-day hands-on REDICHECK training seminars throughout the southeast for 359 civilian architects and engineers. Since December 1985 has been REDICHECKing projects under a $400,000 maximum indefinite quantity contract.

LANTDIV

CHANGE ORDER PERCENTAGES



Fiscal Year	Work In Place ($M)	Change Orders ($M)	C/O Percent
76	62.9	3.1	4.9
77	128.1	6.1	4.7
78	124.2	4.8	3.8
79	122.5	7.2	5.9
80	170.4	7.2	4.2
81	207.5	9.5	4.6
82	278.1	14.2	5.0
83	401.5	25.9	6.5
84	417.1	25.2	6.0
85	466.5	20.1	4.3

Atlantic Division (LANTDIV), Norfolk, Va. — A rotating four-person in-house team has been REDICHECKing projects since May 1985. As of February 18, 1986 the team had checked 52 projects, spent 538 hours, checked 793 contract drawings, and saved an estimated $703,850 in avoided change orders for a savings of over $1,300 for every hour of REDICHECK review.

Similar to the SOUTHDIV training seminars, LANTDIV is conducting eleven one-day hands-on training quality control seminars for A/E firms. These seminars are being held in Virginia, North Carolina, and Puerto Rico during the period of January-June 1986 for over 250 civilian architects and engineers. LANTDIV also requires all A/Es to submit a marked check set of drawings and specifications to indicate that a coordination review has been

If used, REDICHECK could eliminate errors and up to three percent of the total construction costs.

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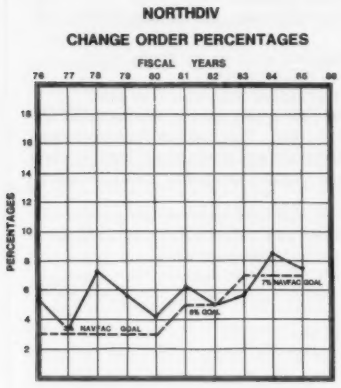
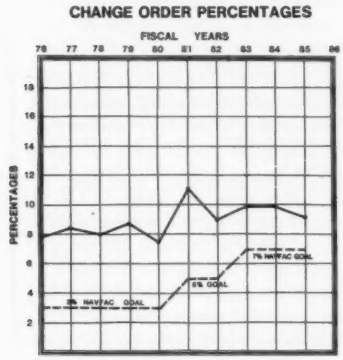


Fiscal Year	Work In Place ($M)	Change Orders ($M)	C/O Percent
76	43.6	2.4	5.6
77	95.0	3.1	3.3
78	97.7	7.1	7.3
79	116.0	6.6	5.7
80	153.5	6.4	4.2
81	176.2	11.0	6.2
82	159.2	7.1	5.0
83	217.4	12.4	5.7
84	211.5	18.0	8.5
85	257.1	19.6	7.6

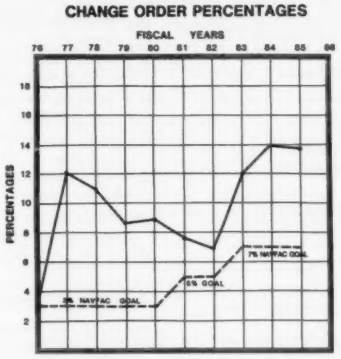
Northern Division (NORTHDIV), Philadelphia, Pa. — Six MILCON projects have been REDICHECKed in-house and a maximum $400,000 indefinite quantity contract for A/E services for quality control interdisciplinary coordination reviews is scheduled to start in July 1986.



Fiscal Year	Work In Place ($M)	Change Orders ($M)	C/O Percent
76	123.0	9.6	7.8
77	162.6	13.7	8.4
78	191.4	14.8	8.0
79	283.5	24.3	8.6
80	384.9	29.1	7.6
81	291.3	32.7	11.2
82	312.9	28.2	9.0
83	487.1	48.4	9.9
84	638.2	63.5	9.9
85	727.4	67.4	9.3

The commands with the most active REDICHECK programs are experiencing the lowest change order rates.

Western Division (WESTDIV), San Bruno, Calif. — A REDICHECK review was accomplished by separate contract on the P-500 Steam Plant at Bremerton, Wash., on the $145 million Travis Air Force Base Hospital project by a joint in-house WESTDIV/OICC Travis/Air Force team; and is scheduled by an in-house team for $500 million in construction related to the Carrier Battle Group homeporting in Everett, Wash.



Fiscal Year	Work In Place ($M)	Change Orders ($M)	C/O Percent
76	15.3	0.5	3.3
77	65.5	7.9	12.1
78	44.0	5.2	11.0
79	56.7	4.9	8.6
80	65.1	5.8	8.9
81	89.1	6.9	7.7
82	128.2	9.3	7.0
83	143.1	17.1	11.9
84	118.1	16.5	14.0
85	151.7	20.9	13.8

Chesapeake Division (CHESDIV), Washington, DC — A $200,000 indefinite quantity contract providing miscellaneous engineering services for quality control/assurance interdisciplinary reviews is scheduled to start in May 1986.

REDICHECK Training

Civil Engineer Corps Officers School (CECOS) and the NAVFAC Contracts Training Center (NFCTC), Port Hueneme, Calif. — During the last five years over 2,000 military and civilians in the NAVFAC organization have been taught the principles and procedures of REDICHECK in the CECOS Construction Contract Modifications Course, and the NFCTC Design Contract Management Course.

Recent Errors found by REDICHECK

The following are some actual examples of coordination errors found before construction contract award and the estimated costs of avoided change orders.

- In a 15-story barracks, a 1-inch discrepancy per floor between two architectural elevation sheets. Estimated savings $125,000.
- In a three-story training-equipment building, a column at variance by seven feet between the architectural and structural drawings is found with a simple overlay. If built as per the structural drawings, the column will be in the middle of the command-board-room, rear projection screen wall. Estimated savings $50,000.
- In a five-story barracks, the length of the building is at variance by 10 feet between the architectural and structural floor plans. Estimated savings $300,000.
- In a $44 million training facility, there is a lack of coordination between the mechanical duct work and catwalks in all major vertical mechanical shafts of the building. Estimated savings $1,000,000.

Updated REDICHECK Checklist

An updated Plan and Specification Review checklist containing a new Civil Section follows.

REDICHECK Plan and Specification Review

1. Preliminary Review

a) Quickly make an overview of all sheets spending no more than one minute/sheet to become familiar with the project.

2. Specification Check

a) Check specs for bid items. Are they coordinated with the drawings?
b) Check specs for phasing of construction. Are the phases clear?
c) Compare architectural finish schedule to specification index. Ensure all finish materials are specified.
d) Check major items of equipment and verify they are coordinated with contract drawings. Pay particular attention to horsepower ratings and voltage requirements.
e) Verify that items specified "as indicated" or "where indicated" are in fact indicated on contract drawings.
f) Verify that cross-referenced specification sections exist.
g) Try not to indicate thickness of materials or quantities of materials in specifications.

3. Plan Check Civil

a) Verify that site plans with new underground utilities (power, telephone, water, sewer, gas, storm drainage, fuel lines, grease traps, fuel tanks) have been checked for interferences.
b) Verify existing/telephone poles, pole guys, street signs, drainage inlets, valve boxes, manhole castings, etc., do not interfere with new driveways, sidewalks, or other site improvements on architectural site plans.
c) Verify that limits of clearing, grading, sodding, grass or mulch are shown and are consistent with architectural or landscaping plans.
d) Verify fire hydrant and street light poles locations against electrical and architectural.
e) Verify profile sheets show other underground utilities and avoid conflicts.
f) Verify horizontal distances between drainage structures and manholes match with respect to scaled dimensions and stated dimensions on both plan and profile sheets.
g) Verify provisions have been included for adjusting valve box and manhole castings (sewer, power, telephone, drainage) to match final or finish grade of pavement, swales, or sidewalks.
h) Verify all existing and proposed grades are shown.

4. Plan Check Structural

a) Verify column lines on structural and architectural.
b) Verify all column locations are same on structural and architectural.
c) Verify perimeter slab on structural matches architectural.
d) Verify all depressed or raised slabs are indicated.
e) Verify slab elevations against architectural.
f) Verify all foundation piers are identified.
g) Verify all foundation beams are identified.
h) Verify roof framing plan column lines and columns against foundation plan column lines and columns.
i) Verify perimeter roof line against architectural roof plan.
j) Verify all columns and beams are listed in column and beam schedules.
k) Verify length of all columns in column schedule.
l) Verify all sections are properly labeled.
m) Verify all expansion joint locations against architectural.
n) Verify dimensions.
o) Verify drawing notes do not conflict with specifications.

5. Plan Check Architectural

a) Verify property line dimensions on site survey plan against architecture.
b) Verify building is located behind set back lines.
c) Verify all concrete columns and walls against structural.
d) Verify on site plans that all existing and new work is clearly identified.
e) Verify building elevations against floor plans. Check in particular roof lines, window and door openings, and expansion joints.
f) Verify building sections against elevations and plans. Check roof lines, windows, and door locations.
g) Verify wall sections against architectural building sections and structural.
h) Verify masonry openings for windows and doors.
i) Verify expansion joints through building.
j) Verify partial floor plans against small scale floor plans.
k) Verify reflected ceiling plan against architectural floor plan to ensure no variance with rooms. Check ceiling materials against finish schedule, check light fixture layout against electrical, check ceiling diffusers/registers against mechanical, check all soffits and locations of vents.
l) Verify all room finish schedule information including room numbers, names of rooms, finishes and ceiling heights. Look for omissions, duplications, and inconsistencies.
m) Verify all door schedule information including sizes, types, labels, etc. Look for omissions, duplications, and inconsistencies.
n) Verify all rated walls.
o) Verify all cabinets will fit.
p) Verify dimensions.

6. Plan Check Mechanical and Plumbing

a) Verify all new electrical, gas, water, sewer, etc. lines connect to existing.
b) Verify all plumbing fixture locations against architectural. Verify all plumbing fixtures against fixture schedule and/or specs.
c) Verify storm drain system against architectural roof plan. Verify that pipes are sized and that all drains are connected and do not interfere with foundations. Verify wall chases are provided on architectural to conceal vertical piping.
d) Verify sanitary drain system pipes are sized and all fixtures are connected.
e) Verify HVAC floor plans against architectural.
f) Verify sprinkler heads in all rooms.
g) Verify all sections are identical to architectural/structural.
h) Verify that adequate ceiling height exists at worst case duct intersection.
i) Verify all structural supports required for mechanical equipment are indicated on structural drawings.
j) Verify dampers are indicated at smoke and fire walls.
k) Verify diffusers against architectural reflected ceiling plan.
l) Verify all roof penetrations (ducts, fans, etc.) are indicated on roof plans.
m) Verify all ductwork is sized.
n) Verify all notes.
o) Verify all air conditioning units, heaters, and exhaust fans against architectural roof plans and mechanical schedules.
p) Verify all mechanical equipment will fit in spaces allocated.

7. Plan Check Electrical

a) Verify all plans are identical to architectural.
b) Verify all light fixtures against architectural reflected ceiling plan.
c) Verify all major pieces of equipment have electrical connections.
d) Verify location of all panel boards and that they are indicated on the electrical riser diagram.
e) Verify all notes.
f) Verify there is sufficient space for all electrical panels to fit.
g) Verify electrical panels are not recessed in fire walls.
h) Verify electrical equipment locations are coordinated with site paving and grading.

8. Plan Check Kitchen/Dietary

a) Verify equipment layout against architectural plans.
b) Verify all equipment is connected to utility systems. □

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situation report

Public Law 97-214, the "Military Construction Codification Act," authorized the services to enter into long-term (up to 30 years) contracts for the purchase of energy products from non-federal facilities and directed the services to demonstrate to the Congress aggressive pursuit of third-party financing before they will consider authorizing any energy plant project to be built with appropriated funds.

In the December 16, 1985 HAC Committee Report, conferees directed the Department of Defense to implement immediately its proposal to rehabilitate and convert steam generating plants at CONUS defense facilities to coal burning facilities in order to promote greater reliance on domestic energy resources. This was directed in order to achieve a DoD coal consumption target of 1,600,000 tons of coal per year above current levels by FY 94.

The conferees also made $25,000,000 in Army industrial funds available to initiate this conversion proposal. They further directed DoD to present a plan for this coal conversion program and to include appropriate funding in future budget submissions.

We currently burn coal at PWC Norfolk, NSY Charleston, NSB Bangor, MCAS Cherry Point, MCB Camp Lejeune, NOS Indian Head and NAB Little Creek. Annual coal consumption for these seven sites is 237,000 tons. The Navy has one plant at MCDEC Quantico being converted to coal and three coal burning plants under construction at NSB Kings Bay, NSY Puget Sound and NSY Norfolk. A new 160 MW coal-fired plant will be built and operated by a third party on Navy property at PWC Norfolk with construction to start in the Summer of 1986.

DoD has tasked NAVFAC to initiate studies for additional third-party coal-fired plants toward a Navy target of 600,000 tons a year additional. NAVFAC has selected potential coal sites at NAS JAX, PWC Great Lakes, NSY Mare Island, NDW Washington, NSY Philadelphia, NAS Memphis (RFP in progress), NETC Newport, and NATC Pax River for study in FY 86 and FY 87.

In FY 88-94 NAVFAC has selected potential third-party sites at NSB New London, MCRD Parris Island, NAEC Lakehurst, NRL Washington, NSY Portsmouth, and NAS Alameda. These studies would be funded by the Army Industrial Fund. Coal burning in these 19 plants, if feasible and economical, would increase our annual consumption by 1,089,000 tons above current levels. DoD guidance remains, however, that we will make no coal conversions that are not life cycle cost effective.

On May 4, 1986, the first of 16 underwater acoustic range hydrophones and two UQC type communications hydrophones was installed in over 15,000 feet of seawater at the Atlantic Fleet Weapons Training Facility (AFWTF), St. Croix, U.S. Virgin Islands. Following over a year of design and planning and a month of logistic preparations, the Ocean Construction Platform (OCP) Seacon successfully laid over 20 nautical miles of special, armored coaxial submarine cable with hydrophone unit number 31 in the Virgin Islands Trough, the deep ocean basin separating the islands of St. Croix and Puerto Rico.

Successful accomplishment of this installation commences expansion of the AFWTF Underwater Tracking Range (UTR) and acoustic ship-to-shore communication system significantly increasing the tracking range capability. This project marks the first installation of fleet tracking range hardware in this depth of water and is due to be completed by early July.

The Chesapeake Division Ocean Engineering and Construction Project Office (FPO-1), by authority of NAVFACINST 5450.73C, among all of the NAVFAC engineering field divisions is solely responsible for providing NAVFAC capability to support Navy requirements for planning, engineering, design, maintenance, repair, inspection and disposal of special underwater fixed harbor, ocean, and shore-based hyperbaric and diving facilities.

Thus it was the logical choice that the Naval Air Systems Command, as administrator of Navy underwater tracking ranges, tasked Chesapeake Division with this project. A detachment of eleven personnel from Underwater Construction Team One is providing deck and diving support to the project as the fleet military ocean construction representative.

Additional information may be obtained by contacting the NAVFAC Assistant Commander for Ocean Facilities (FAC 07), Capt. D. R. Wells, at (202) 325-0505 or Autovon 221-0505.

A mooring motion and platform response experiment using a three-quarter scale semisubmersible moored in 3000 feet of water near Point Mugu, Calif., was initiated by NCEL. A Tactical Aircrew Combat Training System to be installed off the southern California coast in 1992 will include four-sided moored semisubmersible platforms (60 feet on a side), having a displacement of 150 tons and moored in water depths to 10,000 feet will contain electronic equipment to track aircraft during maneuvers and relay data to shore.

The experiment will compile data on rotational and transtational motions (6 degree of freedom), as well as long-term drift and mooring loads. The product will be a coupled platform/mooring dynamic model for platform design and motion prediction. The load and response data will also have a significant role in the design of the mooring components, and in particular, the specification of synthetic mooring lines. □

Waterfront support equipment systems

By LTJG MARK BUFFKIN, CEC, USNR

The Pacific Seabees are tasked with a unique and involved project. Whenever a Naval Construction Force (NCF) project spans more than two deployment cycles, it becomes popular talk among the Seabee community. The Waterfront Support Equipment System is becoming known in this way. The new system is described and explained why it will become a major portion of the Pacific Seabees' future work.

Waterfront Support Equipment consists of the floating pontoons and camels that are used by Naval Stations worldwide to support fleet maintenance to vessels in port. These versatile structures are placed in the water between the pier and the ship to perform a multitude of functions such as to absorb the shock from wave forces that constantly push ships against the fender piles, to provide a working platform for exterior maintenance on the hull, or to provide for adequate support for the many cables and hoses connected to a ship in port.

What does the future hold?

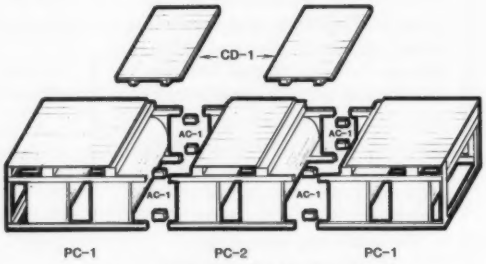
The Waterfront Support Equipment System involves the establishment and start-up of a prefabrication yard in Camp Covington, Guam, for the fabrication and construction of smaller transportable modules called "assemblies" which are the building blocks of the finished structure. The completed assemblies are shipped to Naval Station "anywhere," and connected to form the full component in the desired size and configuration.

The goal is to minimize the labor and equipment required at the Naval base to join the assemblies into the final component. Each assembly has an identification numbering system which enables the receiving facility, the customer, or on-site Seabees to construct the component by following written assembly instructions and diagrams from a manual that comes with the assemblies — in a manner similar to that used in Butler building kits.

The description of the above process is the final objective, yet only half of the job. Completing the prefab yard at Camp Covington was the first phase of the process. Naval Mobile Construction Battalion Five (NMCB-5) began the renovation of the abandoned material storage yard at Camp Covington for the prefab yard and shop space. NMCB-Four is completing the renovation project.

In addition to establishing a special supply yard, both a steel shop and a painting facility are required for the continuous prefab operation. In short, the entire system has been divided into two phases. Phase I is the completion of the prefab yard and Phase II is the operation of the prefab yard.

The "pontoon camel" is the simplest and yet most versatile of the waterfront structures in the system. It is made from ten-foot long, 42-inch diameter pipe floats, from two to ten in number, connected side-by-side.



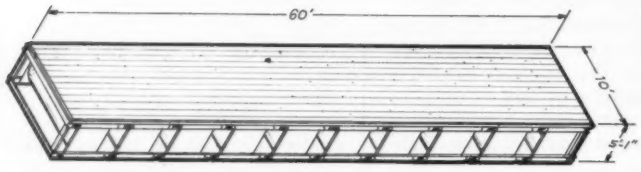
Pontoon Camel (1 X 6) separate

The steel cylinders are "capped off" on each end by 1/2-inch thick rectangular steel plates for airtightness, and joined in pairs by 10-inch steel channel and 3-inch x 5-inch tubular steel diagonal members. The plates are welded to the cylinders and all channel connections are made with 1-inch diameter galvanized bolts.

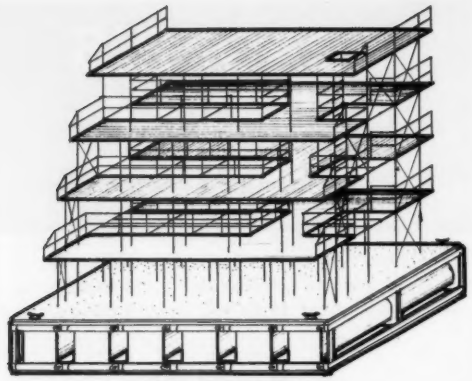
Pressure treated lumber is secured above each pair of steel cylinders for the deck, completing one pontoon camel assembly. The assembly is prepared for shipping at the prefab yard and shipped via ocean transport through coordination with Naval Supply Depot, Guam.

The customer activity will receive several assemblies, depending on the overall length of the component purchased, and connect them together using the galvanized bolts. Each assembly has identifying numbers actually painted on the structure for this purpose. The completed pontoon camel component is then hoisted or launched into the water by the best means available.

The "paint float" is another component in the Waterfront Support Equipment System. Although larger and more intricate, the paint float is also a combination of transportable assemblies. The 42-inch diameter pipe floats are the same as used in the pontoon camel.



Pontoon Camel (1 X 10)



Paint Float (2 X 6)

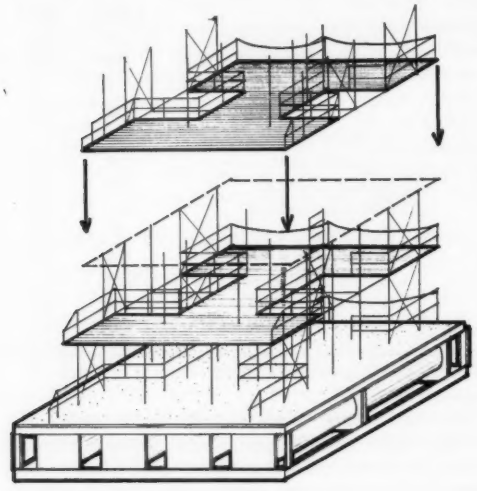
These pipe floats are connected in fours to make the basic assembly for the paint float. The deck assemblies are fabricated from 2-inch x 2-inch tubular steel members supporting 1¼-inch steel grid matting.

All handrails and columns for each deck are prefabbed and temporarily secured to the deck assembly so it can be shipped as a complete unit. Each assembly is primed and painted, marked according to the identification system, and prepared for shipping at the prefab yard.

At the receiving naval activity the steel-deck assemblies are placed into position and secured to the pipe assemblies one after the other. The above procedures are, of course, over simplifications of the prefab and final construction efforts.

The "aircraft carrier breasting camel" is the largest structure in the Waterfront Support Equipment System. Each camel is 60 feet wide by 60 feet long and is supported in the water by twelve 48-inch-diameter pipe floats 29½ feet long.

The pipes are secured to the structure with W18 (18-inch depth) steel beams almost 60 feet long.



Paint Float (2 X 4)

Project tests battalions' skills

3-inch x 12-inch pressure-treated lumber is secured to the steel beam system for decking. The complete structure is hinged in the middle to enable separation into two 30-inch x 60-inch sections.

The camel is placed into and removed from the water in half sections. The aircraft carrier camel is much larger in size and heavier than either the pontoon camel or paint float components, and therefore is divided into a dissimilar system of sub-assemblies.

Each pipe float with beam brackets and manholes constructed onto it is one complete assembly. The rubber fender system is also one complete assembly. The wooden deck is precut and banded together into complete units for shipping.

In short, due to its greater size and weight the aircraft carrier camel has a unique system of sub-assemblies; however, these structures are much less in demand than any of the other waterfront structures.

There are two major reasons why the Seabees have been tasked with establishing and operating this new system. **First**, the fleet needs the floating components provided by the prefab yard. Whether by the NCF or by other sources, waterfront equipment provides support to ship maintenance and services while in port.

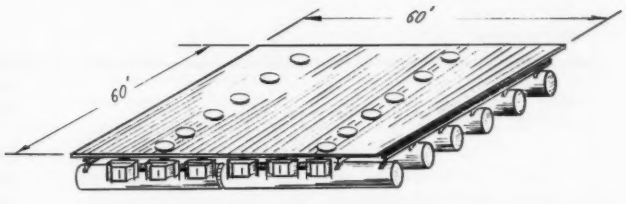
Two reasons why Seabees tasked with this system

Because of the marine environment, the average life of a pontoon camel is from three to five years. Thus, there will be a steady requirement for the camels in the future. **Second**, the Seabees need the experience of establishing and operating in high-output, assembly-line modes for special projects.

Although it has not been since World War II, the Seabees have done this type of construction before. In 1942, during the height of the manpower increase of the United States forces, about 150 regular construction battalions were formed to construct advanced bases overseas and some 40 battalions were formed as "special purpose" battalions.

Some of these special purpose units were essentially mobile factories which, in addition to other functions, constructed and assembled the steel pontoon system of that time (similar to the P-1 system of today). In summary, the Waterfront Support Equipment System provides both fleet support and valuable Seabee training.

Whether or not this widely-encompassing project is a hint of what the future holds for the NMCB remains to be seen. However, the project truly tests the battalion's technical skills and management capabilities. □



Aircraft Carrier Breasting Camel

Navy Civil Engineer

READER'S SURVEY RESULTS

I AM **41** USN **28** USNR **28** USNR (Inactive)
58 Civilian Employee
1 Paid Subscriber **16** Other _____

MY GRADE IS **Military 103; Civilian 55**

I AM ASSIGNED TO
16 NAVFAC **15** ROICC
19 EFD **8** STAFF
7 PWC **33** RESERVE
31 SEABEE **1** CBC
30 OTHER (Specify _____)

MILITARY:
Captain — 13; Cdr. — 26; LCdr. — 19; Lt. — 20; Ens. — 4; Warrant Officer — 8; Chief Petty Officer — 12; Enlisted — 1
CIVILIAN:
GS-14 — 8; GS-13 — 13; GS-12 — 19; GS-11 — 9; GS-10 — 1; GS-9 — 3;

I have **16.9** years of accredited education (elementary, high school, college).
I hold a degree in **151 have degrees**.
Ph.D. — 5; Masters — 58; Bachelors — 76 and Associate Degrees — 12.
I have **18.8** years of government service (civilian and armed forces combined.)
I have/have not contributed articles or material to The Navy Civil Engineer. **35** have; **134** have not contributed.
I have been a reeader of The Navy Civil Engineer for **11.2** years.
I usually read: **47** all; **86** more than half; **31** less than half; **1** hardly any of the contents of The Navy Civil Engineer.

My Rating Of The Magazine

	Excellent	Good	Fair	Poor
My *overall* opinion	86	64	7	1
Editorial content	78	75	7	0
Format	74	80	6	1
Page design	74	71	11	3
Photographs	85	73	11	0
Printing and paper stock	114	45	4	0
Mailing and distribution	95	49	6	3

Of The Standing Departments

	I READ	DON'T READ
Speaking from Topside	153	7
Advice of Counsel	135	19
NAVFAC SitRep	137	24
PW Tek Notes	115	35
Comments/Questions	143	12
News Worth Reviewing	148	7

Delivery and Availability

151 I receive my copy through the mail.
143 It arrives in good condition.
1 It does not arrive in good condition.
15 I receive my copy through Navy distribution channels.
39 Copies are easily and readily received.
3 Copies are not easily obtained.
0 I read my copy in a library or other central source.
53 The copy I read is shared with **39** others.
(who specified numbers shared with average of 4 others.)

Frequency

I prefer to receive the magazine
42 Monthly
48 Bi-monthly
88 Quarterly

Article Preferences

	I LIKE	DON'T LIKE
Research and Development	133	16
Management	137	11
Education and Professional Development	135	10
Engineering and Construction	156	5
Technical Articles	128	15
Seabee Operations	125	16
Reserves	87	37
Environmental Subjects	100	33
Energy Management	111	23
Housing	71	45
Historical Features	143	10

Thanks for your comments!

Thank you for responding to our readership survey published in the Winter Issue of 1986. One hundred seventy-four survey forms were returned to the editorial offices, many with added comments which were very much appreciated.

A tally of the number of answers received for each question in the "quick-answer" quiz is published in its respective position above. Some readers did not answer every question; consequently, the numbers do not always total 174.

The section entitled, "I would like to read more articles about . . . brought in 152 suggestions. That was excellent! Thank you!" Knowing your desires will make it easier to give you what you want in your magazine. After all, pleasing you, the reader, with informative, interesting reading material is our mission.

The other optional section entitled, "I propose to write (or that the magazine editor secure) an article about . . ." contained the same subjects as the 152 suggestions above. Consequently, there will be no further answer here except to say that the number of readers who promised to write articles numbered only a few. The numeral preceding the subject indicates the number of reader responses.

I WOULD LIKE TO READ MORE ARTICLES ABOUT . . .

19 The Seabees
11 Management
11 History
10 Examples of design impact on cost
8 Reserves (new type)
7 Unique technical advancement
6 Trends in design and construction
5 Overseas construction
5 Contract handling
5 Professional development
5 Educational development
5 Public Works
4 Environmental engineering
4 Accomplishments of NAVFAC family (officers and civilians)
4 Personnel assignments
2 Civilian involvement in Navy (outside U.S. too)
2 Base architecture and planning
2 Energy management
2 Computers and computer graphics
2 Leadership in CEC
2 Living conditions at various duty locations
2 Human interest
2 Acquisition and procurement
2 Waste
2 Editorials by Ted Murphy (Note: Neither response came from Professor Murphy!)

The following single suggestions were received: amphibious evolutions; ocean engineering — UCT operations; EFDs; maritime forces/ships; the Navy Civil Engineering Laboratory; problems with historical facilities; difficulties with contractors/claims; radio installation projects; people and facilities; research and development; Vietnam Seabee operations; highway design, construction, maintenance; solutions to daily problems of CEC; airfield repair; motor vehicles and construction equipment; retirees and their activities; space programs and this final (true) request, "Anything, they are all interesting."

PERSONAL COMMENTS OR RECOMMENDATIONS

There were many, many complimentary comments received for which we are eternally grateful and too modest to mention. Thank you! There were also 11 comments of a more critical nature for which we are also grateful. After all, if we don't hear suggestions from you the reader . . . how can we improve?

The essence of these comments is as follows: Distribution is poor; Tighten copyediting; Cover designs are amateurish; Cover lacks contrast (Winter 1986); Quality of articles seems to be slipping; Need subjects of a more general nature; More stringent editing needed (poor grammar); Titles are unimaginative; Magazine should move out of Port Hueneme and away from CECOS and NCEL influence; and one author wrote, "I wrote an article (cover story) and received only one comment from a co-employee. I'm not sure the time and effort was worthwhile to write the article."

Most of the problems above will probably be solved when the staff is returned to full strength: one editor, one associate editor, one editorial assistant and one part-time student aide. For 18 months the magazine has been functioning with a staff of one — the editor, with the part-time help of one illustrator and one student aide.

With a staff strength of three-and-one-half, better copyediting will be acccomplished, more imaginative titles will be created and the quality of articles will improve when more time can be spent soliciting them from prospective authors — this involves time and travel.

Better covers will happen when four-process color is restored to the magazine. Most readers do not realize that all an editor or designer needs to create an attractive cover is one good four-color photograph. Add the logo and a few teasers (titles) to that and an attractive cover is created. Most of the "big-time" commercial magazines do it. Without four-process color, it's much more difficult. Good art must be obtained, two-color combinations must be sought, etc. and with only a one-man staff and a shortage of prepublication time, covers cannot be done over if they are not satisfactory. It's a one-time effort with no chance to create second or third covers if the first one is inadequate. Consequently, some of the cover designs are lacking where a little more time and manpower would provide an opportunity to improve them. The majority of first-rate commercial magazines use one four-process color photograph on their covers and dress them up with a logo and some words. An effective cover is a easy to create once a good photo is obtained.

The author who wrote the article and who did not receive more than one response, unfortunately, experienced a hard lesson most publication editors all know: readers don't respond very often — and usually when they do, it's to complain or criticize. Don't take it so hard, author (I know who you are). It may make you feel better to know that four readers in this very survey expressed complimentary things about your excellent article and how much they enjoyed reading it.

A number of readers complained about the placement of the postal stamp symbol on the address side of the survey form. Yes, it was badly placed and impossible not to destroy it when cutting the page on the dotted line as you were instructed to do. This has not happened before and it will not happen again. We are sorry for this error and at the same time delighted that so many survey forms got through the mails with only three-quarters of a postal stamp.

Thanks again to you readers for letting us know the kind of articles you want to see in future editions of the magazine. Some of your suggestions have been slated for future issues already. Remember, however, that those articles come from *YOU* the reader. If you would like to write about your achievements, projects, etc., and have questions about how to submit them, call the editor of the magazine Autovon 360-3104/5 or Commercial (805) 982-3104/5.

Please write anytime and let us know of your desires. You don't have to wait for a published survey. □

A CHALLENGING TASK

Environmental protection at Kings Bay

By PETER W. HAVENS, M. S.
Ecologist
and
CDR T. J. BUKOSKI, CEC, USN
Energy and Environmental Coordination Officer
NAVFAC, TRIDENT
St. Marys, Ga.

Building a major Naval installation in the 1980s to accommodate our nation's newest weapons system, the TRIDENT II and the OHIO class submarine, is indeed a challenging task for the Officer in Charge of Construction, TRIDENT. Directly employing almost 190 Navy and civil service personnel, OICC TRIDENT also employs numerous A/E firm and construction contractors in the largest peacetime construction effort ever undertaken by the Naval Facilities Engineering Command (NAVFAC).

Designs for the $1.7 billion submarine base must be compatible, the new weapons system must fit, roads must meet, utilities must be available where and when needed, and the environment must be protected.

Within this framework, the Navy, through the requirements of the National Environmental Policy Act, has committed itself to provide an environmentally-sensitive construction program.

In understanding this complexity, two questions frequently arise: "What is the environmental role at OICC TRIDENT?" and "How does this role protect the environment and support mission objectives?"

EIS IMPLEMENTATION

The environmental role at OICC TRIDENT is based upon the Final Supplement to the Environmental Impact Statement (EIS) completed in 1980 after extensive public comment and review. The EIS is actually a supplement to a larger document which was prepared to support the earlier decision to relocate a squadron of POSEIDON submarines to the Military Ocean Terminal, Kings Bay.

Modifications to the document are being developed as engineering criteria for facility construction expansion beyond the scope of existing documents. These documents are our first reference when a question arises about environmental commitments and plans concerning the construction of the TRIDENT base at Kings Bay.

Commitments for environmental protection established by our EIS are quite diverse at Kings Bay. These commitments include provisions ranging from implementation of an endangered species program and environmental monitoring to conferring with federal and state regulatory agencies and providing environmental protection specifications in construction contracts.

Many of these commitments are mitigative in nature; that is, we act to minimize adverse impacts by guiding construction efforts toward less damaging methods.

Mitigation of disturbances may occur either as a portion of an individual construction contract, such as replacing an Osprey nest, or separately, such as creating tidal saltmarsh. We prefer to include mitigation with work which is causing an environmental disturbance and thereby creating the requirement.

Within funding and time constraints, there are also provisions for enhancing the environment at Kings Bay. Developing and creating habitat for waterfowl, and building shorebird nesting areas are some of the commitments we made and are now beginning to execute.

In addition to EIS commitments, Navy and Department of Defense directives also require full compliance with state, federal, and local environmental legislation. Commanding officers throughout the Navy are responsible for, and have legal liability for environmental compliance.

This is the basis for environmental protection during construction at Kings Bay. The objective and responsibility of the Environmental Coordination Office, in general, is to implement the EIS. However, execution of this task requires further explanation.

ENVIRONMENTAL INPUT

There are several established points for environmental input in our construction program which can be divided into the two general areas of Project, and General Environmental Overview during construction.

During project planning, we work with designers in locating facilities in accordance with land use suitability and to either write or direct the writing of appropriate environmental documentation. By reviewing development plans at this early stage, relatively large changes can be made to satisfy environmental goals without adversely affecting construction schedules.

For example, through early review, planners have been able to site a large family housing facility around cypress-gum swamps, incorporating the swamps into the drainage design to help preserve hydrologic regimes.

On a smaller scale, we have been successful in coordinating utilities excavations and fence locations to avoid other small, but important ecosystems.

During the project design phase, our office works with Navy project design engineers and A/E firms. We provide basic environmental constraints that designs must incorporate. Initially, we review a design concept and provide a "preview" of environmental considerations regarding any particular project.

At that time, major regulatory requirements are identified. Then, with most individual projects, we review plans and specifications at 35- and 100-percent stages.

At the 100-percent stage, we prepare a "tailor-made" Environmental Protection Specification section for each construction contract. Understanding that construction contractors are most attuned to specific requirements in our specifications, we also have prepared, and now include a separate Erosion and Sedimentation Control Specification for each project.

Environmental review during this design phase is probably the most critical aspect of our job because it must be a dynamic process to be effective. Since development results in environmental change, a static approach can miss or even mis-identify important environmental considerations.

At best, the static approach to design review allows only the most basic environmental protection. Environmental review must evolve by integrating information from as many current site-specific sources as possible. The resulting benefits can be extensive and include:

- Reduction of erosion and subsequent sediment transport
- Control of on-site maintenance activities and the potential for oil, or other hazardous substance spills
- Avoidance of construction in sensitive wetland habitats, and
- Avoidance of accidental damage to wetlands

When the project progresses to construction, we work with the ROICC to achieve our objectives. We attend preconstruction conferences to review environmental specifications with the contractor, answering any questions that may arise. We also provide guidance to the ROICC officer on installation and maintenance of environmental protection measures.

Since proper installation of erosion and sediment controls is important, we start by walking the construction sites with field personnel before the beginning of construction to identify areas which are most likely to cause erosion problems.

Monitoring efforts from construction site inspections, from engineering studies, and even from on-site experiences at other projects are all brought together during construction. We thereby incorporate learning into our design reviews to obtain current site-specific results.

All environmental problems are virtually impossible to foresee before construction begins. Problems with improper siting, installation, and maintenance of erosion control measures will continue to occur in the field, sometimes resulting in additional environmental impacts. Accordingly, ways are suggested in which environmental protection may be added during construction.

Such added items have included installation of artificial osprey nesting platforms as well as installation of additional erosion and sediment controls for troublesome areas. We also have identified inappropriate environmental protection measures which have been deleted from contracts and thereby reduced costs.

The second major environmental input area of General Environmental Overview concerns the more general environmental compliance efforts. These items are handled directly through our office and usually involve a broad mitigative approach. We administer our annual environmental monitoring program which is executed by contract with environmental consultant firms.

The goal of this effort is to provide current biological and physical data to use during contract review as well as to document the effects of our construction work. Comparison of the actual effects of construction on the immediate environment with EIS predictions is one of our EIS commitments. So far, monitoring has confirmed many of these predictions. However, some environmental effects have been less extensive than expected.

Our environmental monitoring program continues to provide us with current information on construction impacts. As required by our EIS, it emphasizes water quality alterations; however, the program also assesses biological indices of environmental contamination, protection of endangered species, and vegetative succession and habitat change that occur in response to TRIDENT development.

An extensive database assembled during the first four years of Kings Bay development has provided the much needed historical support to evaluate ongoing changes in environmental quality. We recently expanded the program to include precise information from additional *in situ* measurements at frequent intervals.

We also have a non-routine analytical capability within the environmental monitoring contract enabling us to study unexpected problems as they arise. We are monitoring U. S. Army Corps of Engineers contractors during dredging operations at Kings Bay to identify environmental problems associated with dredging and to suggest ways to avoid damage.

We have established several permanent vegetative quadrats within selected hardwood swamps on base to determine what, if any, long-term changes have occurred in wetland hydroperiod and vegetation as a result of development.

Another aspect of general environmental compliance is habitat reclamation and wetland mitigation. Our EIS requires us to provide, as mitigation, 110 acres of wetland and wildlife habitat. To meet this goal, we have begun to incorporate wetland development within construction contracts and to design vegetation plantings for site reclamation.

Borrow pits are ideal sites for this type of development. Other suitable locations include dredged material disposal and drainage ditches near estuarine areas.

We also plan for establishment of wetland vegetation as part of the normal landscaping for some projects. The cooperation of designers in modifying their work to help achieve environmental goals is remarkably notable.

Several U.S. Army Corps of Engineers dredge and fill permits, issued under Section 404 of the Clean Water Act and Section 10 of the River and Harbors Act require the mitigation of saltmarsh loss through the "creation" of replacement saltmarsh from excavated non-wetland areas. So far, less than five acres of saltmarsh loss requiring this type of mitigation have been experienced but we have planned for the creation of at least 40 saltmarsh acres in new drainage swales and borrow pits in anticipation of addi-

tional losses. This "banking" concept is the first used in Georgia.

Other state and federal regulatory agencies are joining in to provide more effective environmental support to our program. The U. S. Fish and Wildlife Service has completed several habitat studies for us through an interagency agreement.

The Georgia State Department of Natural Resources has been very cooperative in helping monitor our osprey population on base and in siting the construction of artificial reefs with construction debris. These and other studies will help us to implement our EIS requirements for habitat development and provide the best possible product for our customer.

FOR THE FUTURE

In the near future, plans will be completed to implement the EIS. These plans outline specific mitigative actions required both during and after construction. The draft plan includes a listing of the required items grouped by topic and a separate discussion of each requirement.
by topic and a separate discussion of each requirement.

Responsible personnel, projected schedules, and expected costs for completion of each requirement as well as a program for follow-up have been included.

The environmental monitoring program will continue to evolve and expand to follow construction. Increasing precision in design review will result in a Naval base designed more sensitively toward environmental considerations. This year, an environmental contractor will begin to assess our saltmarsh resource so that we can determine what losses have occurred.

Another contractor will begin an assessment of vegetation found in the transition between saltmarsh and upland areas at Kings Bay. This information will be used to better define saltmarsh mitigation plans and to support reclamation planning.

Plans will begin for the shifting of the environmental protection program to the base operating personnel. Many EIS requirements will not end after OICC TRIDENT completes building the base. For example, the annual environmental monitoring program should continue, thus ensuring continuity from the construction phase.

In summary, some of the established methods the OICC TRIDENT follows to protect the environment while Naval Submarine Base, Kings Bay is being built are outlined. Several points for environmental input during planning, design and construction are critical as we proceed toward completion of our work. It will become increasingly difficult to effect positive change as our work picks up speed and we approach the day in 1989 the first TRIDENT submarine arrives; however, the cooperative attitude of all concerned ensures the OICC TRIDENT program to protect the environment at Kings Bay succeeds. □

speaking from topside

RAdm. Cam Fraser

In 1966, when I first arrived in Washington as a hard-charging Lieutenant Commander, I postulated there were 10 people (Navy, OSD, OMB, Congress) between me in a lowly staff position for CNO and actually getting permission to execute a project. Today I postulate there are literally hundreds of people who can touch a decision adversely and prevent execution.

The probabilities for change at this Washington level are quite low so we must go at our future with the expectations that appropriated funding for MILCON projects, BOS and RPMA, OPN, etc., will lag far behind what we believe are requirements. Making clear our requirements argues for adding a marketing and sales dimension to our required skills for success in the CEC and the NAVFAC family.

We must emphasize clear and concise justification (sales pitch) for adequate funding levels for each and every need our customers have or we will never be able to satisfy those needs. In addition, I predict we will find a greater challenge every year to be more productive with what we get — ideally, a tool in every hand and every hand trained and skilled to use it to meet a real need.

Enough of theory — There are three major customers I will talk about here and try to pique your interest in contributing to their satisfaction.

First Customer: the Navy, the USMC, the Nation at War

The reason CEC Officers are in uniform is to be prepared for war. To win a sustained war we need Seabees or their equals (there are none) to repair and build and operate the infrastructure vital to sustained operations and replenishment of the fighters. To do the job we must sell the need for and be able to execute a balanced capability to perform the CINC's priority requirements. The model looks like this: (diagram next page).

With the help of over 200 superb CEC reserve officers we have made great strides over the last three years in improving war plans (CINC requirements and transport plans), selling the need for and buying equipment, tools and organizational material, and adding a 9th active and 18th and 19th reserve mobile construction battalion (MCB) and programming a 10th active MCB for FY-89. We still have a long way to go to balance our capabilities and get full consensus on "best guess"

CINC requirements. However, with the continued strong support of the CEC-Seabee reserve organizations, I'm confident we will get better and better.

Second Customer: the Navy of the year 2,000 AD

When I arrived in Washington 20 years ago, we had a military construction project backlog of $15B and our $85B plant was overage by only a few billion dollars. Today, our backlog is $17B; our plant is over $30B overage and now going overage at a rate of $2B per year due to the heavy slug of WWII facilities in the inventory. We are spending between $1.5B to $2.0B on MILCON primarily on new mission and we're losing ground. While we can do much hand-wringing, the answer lies in helping our senior decision-makers to better understand the problem by hard individual project examples and the impacts of further deferral of solutions.

Recently, we have been able to fund dedicated, skilled economic analysis of promising replacement and modernization projects to gain better understanding and justification. At the same time we are making steady progress to promote the use of 3rd party services (including related facilities) where economics clearly argue for a private sector solution.

The most promising areas for use of contract services for delivering on Navy customer needs better and more economically lie in the mature, competitive segments of the private sector such as housing (both family and bachelor), food service, recreation, and medical services (both hospital and outpatient).

This limits on solutions to better serving the future Navy ashore are self-imposed. Creativity, a good marketing strategy and persistent and persuasive sales efforts are the keys to getting good solutions from dream to reality. I challenge all who read these words to "go for it!"

The Third Customer: Today's Navy People and their leaders

This long suffering customer (except at Bangor and Kings Bay) will continue to depend on our ingenuity to be more productive with what we get to work with. I was super elated this year to have converted so many new believers in supporting increased funding for maintenance and repair funds. Our $800M FY-86 budget submitted to Congress last January was increased to over $1B by new believers in NAVCOMPT, OSD and Congress by December of this year. $230M was added! Unheard of!

The Gramm-Rudman-Hollings deficit reduction impact was to cut all $230M. The improved understanding is in place but no dollars this year. Our expectations and plans should be based on essentially level funding plus whatever comes each September from other accounts. Therefore, our more direct challenge is to enhance the value in place of what a dollar buys. Too hard? I think not.

We have so many recent examples from C/A cost studies of dramatic changes in cost per unit of service delivered when the working people at the point of delivery are challenged to be most effective. All C/A examples are available for the asking.

For the past two years I have been working with a handful of very bright people of the Coopers and Lybrand management firm on improving productivity in PWCs. The jury is out but I predict costs per unit of delivered service will drop overall by 30+% primarily from radical surgery on overhead and indirect labor costs, increased training investments, and cutting large numbers and layers of "management and supervision."

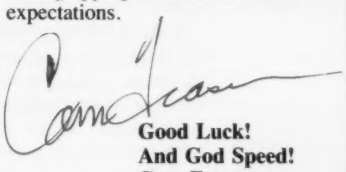
The lessons of these changes will eventually bump into the PWDs if one chooses to wait to have someone else tell the PWOs. The aggressive PWO can get the best of possible improvement ideas now by keeping him or herself wired into the major experiment at PWC Norfolk.

There is no end of challenge in today's Navy. Creative change will be necessary to come close to filling the needs and proper expectations of the today customer, the customer at the turn of the century and the customer when the "balloon goes up." A sage CEC senior taught me an equation which I find particularly good to end this piece.

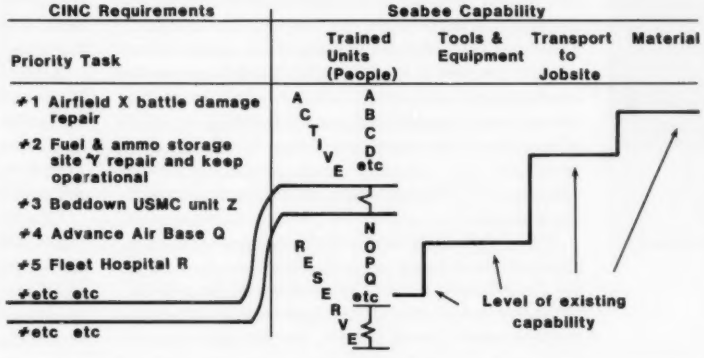
$$\text{Satisfaction} = \frac{\text{Reality}}{\text{Expectation}}$$

$$\text{example: Bad} = \frac{\text{Good}}{\text{Great}}$$

The challenge is to work to improve reality while marketing and selling appropriate and achievable expectations.



Good Luck!
And God Speed!
Cam Fraser
RAdm. CEC, USN



SOPHIA ASHLEY:

Federal Engineer of the Year advocates training for new engineers

By LALLIE P. DAWSON
NAVFACHQ, PAO

"I was determined to learn."

If the motivating philosophy of Sophia Ashley, award-winning physicist and mechanical engineer, could be stated in one sentence, that would be it.

Born Sophia Kokkinos near Corinth, Greece, Ashley's heritage reflects a quest for knowledge and a willingness to work hard. Her mother left home at the age of 12 to attend a teachers' academy some distance from her village. Ashley herself left Greece in 1961 at age 18 to attend school in the United States.

Today, Ashley performs wind-tunnel research at the Naval Civil Engineering Laboratory in Port Hueneme, Calif. She was named Federal Engineer of the Year by the National Society of Professional Engineers.

The Federal Engineer of the Year recognizes the contribution of engineers in the public sector. Ashley was selected for the honor from a field of 40 finalists, five of whom were from the Department of Navy. The federal government employs 90,000 civilian and military engineers.

Ashley's selection for the award was based on her research, as well as her humanitarian and community contributions. As a result of her research, a design manual was compiled that assists building designers who wish to use natural ventilation for building and people cooling — in other words, air flowing through windows will ventilate and cool the occupants and the building.

The mathematical tables she developed are used to calculate the amount of air flowing through a building, based on the size of the windows. If the amount of airflow is not enough to supplement or replace a manufactured cooling system, the designers can determine the size windows needed to increase the airflow.

Ashley serves as president of her local section of the Society of Women Engineers and was the first woman to be named Engineer of the Year for the Engineering Council of the San Fernando Valley.

But to understand this dynamic woman and her road to professional success, one must return to Ashley's family in Greece. Her father wanted his five daughters to be independent.

"My father had to decide whether he could afford to send all of us to school," Ashley teased, "or if he could afford to pay dowries for all of us."

Becoming serious, she continued, "Being a civil servant in the judicial branch, my father had seen a lot of injustices against women by their spouses. Married women in Greece could not leave their husband's household to support themselves. My father wanted my sisters and me to be independent."

Although her mother ceased teaching formally fifteen years after her marriage, she continued her role as an educator with her daughters. She tutored each of them in mathematics and science, subjects that she particularly enjoyed.

Ashley's early education in Greece followed the British education system. Although Ashley deplores the British system for discriminating against students who were not "the cream of the crop," she credits its techniques for instilling a strong discipline of study and for directing her into her current career.

"Every year we took math and science, ancient Greek and a foreign language — six basic courses each year," Ashley explained, "and you had to pass all of them. If you failed two major courses, you repeated all six courses for that year, even though you made superior marks in the other four classes.

"Strong discipline did it for me"

"Then they separated us after three years into classical studies and practical studies," she continued. "In practical studies, we spent more time with math and science than with classical studies like history, ancient Greek, and Latin. We studied biology, chemistry, physics, and mathematics."

Ashley's odyssey into the American education system is an interesting one. Years ago, her grandfather voluntarily became an indentured servant to raise money to send his brother to the United States. His brother — Ashley's great-uncle — settled in Monroe, Louisiana, and became a millionaire during World War II.

When Ashley's oldest sister finished high school in Greece, the great-uncle wished to repay his brother, so he insisted that his brother's granddaughters come to America to attend college. He was a key benefactor to Northeast Louisiana University in Monroe, so that was the college his great-nieces attended.

As a result of her great-uncle's sponsorship, all five of the Kokkinos sisters became Ameican-trained scientists.

"My older sister is a nuclear chemist," Ashley enumerated, "I'm a physicist and a mechanical engineer, and my younger sister is an electrical engineer — a second level manager for IBM. The fourth daughter is a theoretical physicist working with the Department of Education of Greece — she returned to Greece after receiving her education. And the youngest is a mechanical engineer working for the Navy at Point Mugu."

Ashley's strong desire for higher education has had its benefits in other areas as well. Sophia Kokkinos met Joe Ashley while studying at Northeast Louisiana, and they married after she graduated in 1965. Joe Ashley is also a physicist and mechanical engineer who works in the combat support division of NCEL. They have one daughter, Natalie, now 16.

"Natalie's an outstanding student," her mother said, proudly. "She's highly motivated, a born leader, and president of her junior class.

"Natalie's active with the speech club," said the woman who once struggled to master conversational English. "She received a silver medal for speaking. Like most teenagers, she's never at a loss for words and likes to have the last word."

Ashley looks forward to observing her daughter's career selection, although Natalie is not interested in engineering at this time.

Ashley and her husband are both studying toward doctorate degrees in public administration at the University of La Verne in La Verne, Calif.

"We've felt some competition," she explained. "but a healthy amount, and we balance each other in our abilities. For example, I'm better in mathematics, and he's better in logic and management. He's a natural writer when it comes to papers for our classes, so he's helped me a lot."

Ashley anticipates completing her doctorate in another two and one-half years. She's already picked the subject for her dissertation — an evaluation of the Navy's portion of the Federal Women's Program.

"I'm going to try it," she said, enthusiastically.

Sophia met Joe Ashley in college and married him. Today, they hava a daughter, Natalie (left).

"How quickly I finish will depend on how much support I get in collecting all of the data I need."

Ashley serves as Federal Women's Program coordinator for NCEL. But her concern for equal employment and career opportunities are not limited to women. She's concerned about the training programs for all engineers working for the government.

Recalling her own early career as a research scientist, she said, "Even though I was a re-entry type of person, I was basically a new engineer. In 1978, when I started working for the Navy, I didn't think the training for engineers was sufficient. You need to have dedicated senior engineers who will take the junior engineers under their wings, to work with them on their projects and show them what to do.

"This takes time," she admitted, "and very few senior engineers have that kind of time. We've begun to emphasize training, especially during the last two to three years. The training deficit has turned around tremendously, and we're seeing that new engineers get the proper training and experience to become good engineers."

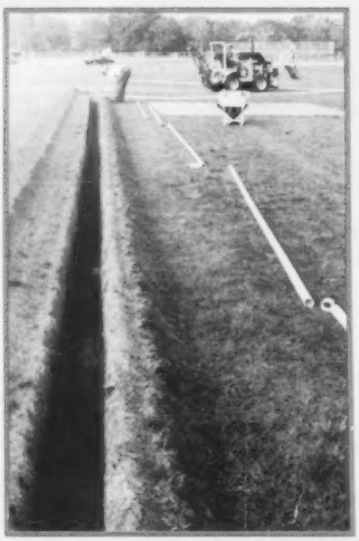
Ashley will continue her research in wind tunnel model testing, particularly to develop a wind shield for soft modular combat shelters (SMCS), or tents. She also will develop chemical, biological, and radiological protection for SMCSs and design guidelines for chemical protection of new Navy buildings.

Despite the recognition and adulation, Ashley firmly believes that she will always need to learn more. And her quest is not limited to physics and engineering — she's especially interested in understanding human attitudes and how independent scientists can join together as a team to accomplish needed research. ❑

From hardhats and shovels...

Group of Seabees repairing a lighthouse garage.

EO3 Champion grades the road behind the Naval Aviation Museum.



UT3 Evans and UT3 Lockrem install sprinkler system on the Aviation officer Candidates' Parade Field

By LT. DAVID M. BOONE, CEC, USN

What happens to a Seabee when he leaves the Construction Battalion? Among the various billets available to Seabees are with the 19 Construction Battalion Units (CBUs). Modeled after the Construction Battalion, the CBUs provide a shore duty billet while maintaining the Seabee training to insure a state of readiness in individual and unit skills.

For many "A" school graduates the CBU is their first exposure to the "Big Green Machine." The CBUs also have female occupational field 13 personnel which give many capable females the closest challenge to the fast-paced pressure of Construction Battalions they will possibly ever see. Some CBUs have billets for divers to get them back into the mainstream of Seabee life.

Within the "Cradle of Naval Aviation" at NAS Pensacola, Fla., there exists one such CBU. CBU-402 is a 90-person unit with most of the experienced personnel coming out of battalions; 24 reported on board from Gulfport battalions and five more from a West Coast battalion (NMCB-40).

With 43 "A" school graduates there is a lot of inexperience. Normally a 40-person unit, CBU-402 has received a special allowance of an additional 50 people to facilitate the construction requirements in preparation for the 75th anniversary of naval aviation in May 1986.

The estimated 250,000 people to come through NAS Pensacola has resulted in a great deal of emphasis on base improvements which is being implemented in the Base Exterior Architecture Plan (BEAP). The unit has become highly involved in the NASP facelift with 85% of the unit's projects funded by BEAP.

Many BEAP projects are being completed by civilian contractors, but the unit has been tasked with an excellent combination of BEAP work requiring the skills of all the Seabee rates. Among some of the projects on the list are the rehabilitation of Building 191 to a museum and the Barrancas Lighthouse both historic monuments, assorted paving jobs, installation of paver brick in the historic downtown area, bus shelters, sprinkler systems, and ball fields.

Although limited by the recent surge in BEAP projects, the unit has also provided support to the outlying fields in the immediate area at Whiting Field, Saufley Field, and Corry Station with potential projects as far away as Panama City. Community relations are maintained with an occasional project in the civilian sector for schools, churches, etc.

A dedication ceremony was conducted for the Boy Scout District Council Building which had the ground work and warehouse constructed by the unit. A project is

BU3 Bell and BU3 Ellis screen sand into a planter on paver brick job in the command area.

BUCN Hakey striking off mortar on bus stop.

to combat helmets and rifles

planned to clear five acres for a school of the retarded so land can be used for farming by the students.

In August, the unit switched from hardhats and shovels to combat helmets and rifles. The unit was recalled and mounted out in 48 hours for a construction contingency exercise in enemy territory. With the 48-hour countdown underway, the unit planned, prepared, and mobilized all equipment, tools, and material to sustain a deployed unit in the field for a week. The unit deployed to Camp Rudder at Eglin Air Force Base.

A 19-man advanced party departed NAS Pensacola in two UH-1's with the cooperation of HC-16. Under the direction of SW1 Palmer (Brewmaster), the advanced party landed in a hot LZ under enemy fire and secured the predesignated campsite with a hasty perimeter defense. The 14-vehicle main body convoy arrived an hour later having successfully repelled an ambush with EOC Hamilton (Snake) as the convoy commander.

In addition to the military training received, construction and security crews were deployed from the base camp to complete the construction of four LZs large enough for six hueys each. The unit was tactical the entire week and both construction crews and base camp personnel were aggressed on irregular intervals. The field exercise provided valuable experience, particularly in leadership development, training, ingenuity, and imagination.

The 75th anniversary of naval aviation will come and go in May 1986 but the Base Exterior Architecture Plan will continue to be executed for years to come. Naval Air Station Pensacola is undergoing an operational facelift from primarily a training command to a fleet operational base in support of additional ships to be stationed here.

It is anticipated that the Pensacola area (on and off base) will increase another 100,000 people or approximately 30% of the existing population by 1992. This population includes personnel on the ships, everyone to support the ships (military and civilian), and all their families.

CBU-402 will play a vital role in this transformation and its effectiveness will prove critical to meeting the construction requirements by 1992. The unit's current personnel augmentation will vanish in October 1986 and the numbers will decline to 40.

Although CBUs are separate activities of the naval shore establishment they are components of the Naval Construction Force with a mission of providing the training necessary to maintain the readiness of a contingency construction capability for the naval construction battalions. The CBUs are a valuable means with which to maintain Seabee skills as well as being a feeder system in the battalions. □

UT1 Wise guards the home front.

BU3 Cortazzo, the machine gun man.

BU1 Austin stands guard and calls in her security.

CE1 Lozano at work.

BU2 Daniels and BUCN Fuller pause.

AN UNUSUAL CLIENT FOR ROICC

Unique "ground breaking" in Somalia

By LCDR COURTNEY J. McCRACKEN, CEC, USN
P.E., Calif.
ROICC Somalia

Somalia, a country of six million people on the Indian Ocean coast of Africa, is the site of one of the Naval Facilities Engineering Command's (NAVFAC) more remote Navy construction offices. The Resident Officer in Charge of Construction (ROICC), Somalia, a field office of the Atlantic Division, NAVFAC, administers construction contracts over a wide geographic and climatic range, from the windswept northern town of Berbera on the Gulf of Aden, where temperatures commonly reach 130° Fahrenheit, to the centrally located capital of Mogadishu, a city of one million people on the Indian Ocean, and to Kismayo, a small fishing and agricultural community in southern Somalia.

In Kismayo, the ROICC has an unusual client. It is the United States Agency for International Development (USAID) Mission in Somalia, an arm of the State Department. USAID provides economic, technical and related assistance to this developing African nation.

The construction project which our ROICC manages for USAID is a $19.9 million port rehabilitation project, an important ingredient in the economic development of Somalia. It provides access to capital goods and agricultural commodities and facilitates the export of livestock and agricultural products.

The major item of work is the replacement of 2070 linear feet of pier. It will be accomplished in stages so that two of the four berths will be usable at all times. The contractor will remove the exhibiting concrete deck, pile caps and fendering system and cut off the existing concrete piles. A steel sheet pile bulkhead will then be driven 40 feet in front of the existing face of the pier and tierods and deadman anchorages installed.

After backfilling, the new concrete deck and fendering system will be constructed. The project also includes channel dredging and the construction of navigational aids, yard lighting, sanitary facilities, power distribution system, roll-on, roll-off ramps and mooring dolphins.

The project was in the planning and design stages for three years. In September 1982, the Project Grant Agreement was signed by the Somali and American governments. USAID hired Parsons Brinckerhoff International (PBI) to perform geotechnical investigations and prepare a preliminary design. In August 1983, final design was authorized, and in September 1984, the agreement was signed which provided for the construction to be funded partially by each government.

The total budget for design, construction and administration was $45 million, with funding to be provided

WORK BEGINS **Ambassador Bridges and President M. S. Barre cut the ribbon which allowed the crane to remove the first piece of the old pier.**

by the U.S. government in the amount of $42 million and by the Somali government in the amount of $3.4 million.

During 1984, NAVFAC agreed that it would act as USAID's construction agent for this project. A memorandum of understanding between the two agencies was signed in March 1985.

On September 6, 1985, USAID signed a contract with PBI for construction surveillance. This contract was subsequently assigned to NAVFAC for post-award administration.

On September 9, 1985, the Atlantic Division of NAVFAC awarded the construction contract to the George A. Fuller Construction Company which submitted the low bid of $19,990,000 for all bid items. The contract provides for payment of 105 million Somali Shillings in addition to the dollar amount. The shillings have a current purchasing power approximately equivalent to one million dollars.

The contract requires Fuller to build and furnish living quarters, recreational facilities and offices, and provide messing, potable water, vehicles and other logistic support for the ROICC staff in Kismayo.

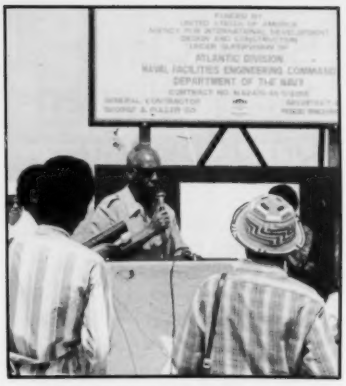
The ROICC staff in Kismayo consists of an AROICC, one PBI engineer, one civil engineering technician, and a Somali engineer on loan from the Somali Ministry of Ports and Marine Transport.

On January 7, 1986, a rather unique "ground-breaking" ceremony was held. The primary participants were the President of the Somali Democratic Republic (Somalia), Mohamed Siad Barre, and the U.S. Ambassador to Somalia Peter S. Bridges. Rather than turning the traditional shovelful of dirt, they cut a ribbon which "held back" a crane.

When the ribbon was cut, the crane lifted a section of the existing fendering system, symbolizing the beginning of the demolition of the existing pier.

The President, the Ambassador, and the USAID Mission Director Mr. Louis Cohen all spoke of the importance of the project to Somalia's development.

Many high ranking Somali officials were in attendance including the Minister of Public Works Abdulkasim Salad Hassan. Afterward, everyone enjoyed lunch at the local hotel featuring the traditional Somali specialty, roast goat and rice.



President Mohamed Siad Barre addressing the gathering.

It was an auspicious beginning to a construction project which is scheduled to require 33 months. The contract completion date is June 11, 1988. □

A POPULAR CURRENT ISSUE

Proprietary Specifications

By DAVID C. PETRONE

A common complaint from NAVFAC personnel at the Engineering Field Division and its field offices is that the government is too lenient in enforcing strict compliance with its specifications. This issue often arises in the situation in which a contractor offers to supply an item of work, which in the opinion of the design engineer or the customer, is not in compliance with the "intent" of the contract. What is sometimes perceived as the government's ineffectiveness in being able to demand strict compliance with a contract specification is often the result of the government's use of proprietary specifications.

It is normal practice for a design engineer (either an in-house government employee or a contractor architect/engineer) to review brochures or other information of a particular manufacturer in preparing specifications for a construction project. It would also not be uncommon for a particular manufacturer to try to convince a design engineer to specify their particular product in a proposed contract.

Accordingly, specifications for items of work required by the contract are often written "around" the product of a particular manufacturer. It is this practice which frequently leads to disputes between the contractor and the government in interpreting contract specifications.

There are two distinct forums in which the issue of proprietary specifications may be raised. Before bid opening, if a prospective bidder believes that a contract specification is unduly restrictive, a protest concerning its proprietary nature might be filed with the Comptroller General of the United States at the General Accounting Office (GAO). After contract award, a contractor may appeal the final decision of the contracting officer to the Armed Services Board of Contract Appeals (ASBCA) (or the Claims Court) which decision has denied a contractor's claim for increased costs resulting from the government having required the contractor to provide a product different from that which the contractor initially had proposed to the government for use in the work.

The Federal Acquisition Regulation (FAR) Part 10, requires that agencies specify their needs in a manner designed to promote full and open competition. To fulfill these policy requirements, the FAR allows federal agencies

Continued on next page

Basic Class 178 graduated on June 6th

On June 6, 1986, Basic Class No. 178 graduated from the Naval School, Civil Engineer Corps Officers, Port Hueneme, Calif., and 17 young naval officers — men and women — accepted assignments that would take them to all parts of the world. The class completed eight weeks of specialized training pertinent to the Navy's needs for shore installation engineering, public works management, and Seabee operations.

Three members finished with honors: CWO-3 Fred W. Geiger was the outstanding graduate. Also graduating with distinction were Ens. Jeffrey D. Jorgeson and Ltjg. David R. Wilkins. Ens. Geiger's photograph is indicated by a (★); those graduating with distinction are indicated by a (●), and those entering seabee duty are indicated by a (†).

Graduation was held in the CECOS auditorium at 10:00 a.m. The guest speaker was Capt. James B. Caughman, Jr., CEC, USN, Commanding Officer, Naval Civil Engineering Laboratory, Port Hueneme who was introduced by the CECOS Commanding Officer Capt. Brian J. O'Connell.

★CWO-3 Geiger, Fred W.
to Guantanamo Bay, Cuba

Ens. Cook, Richard D.
BSME/Univ of Penn
to Annapolis, MD

Ens. Davis, John D.
BSCE/Univ of Maryland
to Guam

to include restrictive provisions or conditions in its specifications only to the extent necessary to satisfy the minimum needs of the agency or as authorized by law.

This "minimum needs" concept has been used by the GAO to determine whether there is sufficient justification for an agency to include restrictive features in its specifications.

If the issue of proprietary specifications is raised after award of a contract, the ASBCA (or the Claims Court) will review the dispute in the context of the Material and Workmanship clause of a standard construction contract. Under this clause, specifying a product by its brand name merely establishes a standard of quality, and an alternative product proposed by a contractor need not have all of the requirements of the specifications, only the essential ones.

The predecessor to the current Claims Court has even held that the Material and Workmanship clause is applicable when the government writes the specifications around the product of one manufacturer without specifying the brand name of the product.

> "Can the product offered do the same job in a like manner with the desired results . . .?"

Accordingly, when a specification references a brand name product or includes a detailed description of the proprietary characteristics of one manufacturer's product without mentioning the brand name, the government is required to accept a contractor's alternative product which is "functionally equivalent" to the brand name product specifically mentioned or described.

The difficulty in litigating the issue of proprietary specifications is that the contract specification rarely states what the essential requirements of a product are and why they are essential.

This situation places the trier of the facts hearing the dispute in the difficult position of determining what are the essential requirements of the government and whether the item offered by the contractor failed to meet the important functional characteristics of the brand name product.

The primary consideration used by the ASBCA in determining functional equivalence is whether the equal product offered can do the same job in a like manner and with the desired results and not necessarily whether certain design features of the brand name product are present in the equal product.

Is a double-flow cooling tower offered by a contractor the functional equivalent of the single-flow cooling tower specified in a contract? Is a light cover made of plastic which could withstand the blow of a baseball bat functionally equivalent to a glass refractory with a metal guard which the contract required?

In both cases, the ASBCA has held that there was a functional equivalence and that the government's rejection of the proffered products by the contractor was improper and constituted a constructive change to the contract which entitled the contractor to an upward equitable adjustment in the contract price.

From what has been said so far, it might appear that the government cannot obtain the products it actually desires. This is not the case, however.

Generally, the government has a right to enforce strict compliance with its specifications. Because of the policy of full and open competition, however, an exception has been made to the strict compliance rule whenever the government specifies a brand name product or requires a product with the proprietary characteristics of a single manufacturer.

The major cause of litigation concerning the issue of proprietary specifications relates to the government's failure to be open and clear about the proprietary nature of its specification.

Although NAVFAC Contracting Manual P-68 requires specifications to be written to provide bidding by any supplier whose equipment provides the functional, technical, and physical requirements of a project, it also provides authority and the procedures to be followed when the product of a particular manufacturer is absolutely necessary and no substitute will serve the government's purposes.

As P-68 explains, once the appropriate approval has been received to utilize restrictive requirements in a

specification, in order to negate the effect of such clauses as the Material and Workmanship provision of the contract, the specification should state: "Notwithstanding any other provision of this contract no other product will be acceptable."

If the government has a legitimate need for the product of a sole source manufacturer, in resolving a protest on this issue, GAO will generally not attempt to substitute its judgment for that of the contracting agency where there is a rational basis for an agency's proprietary requirements.

When the issue arises as to whether or not the government can properly

> "The worst thing for a designer to do is disguise proprietary requirements in a specification."

reject a product which the contractor proposes to substitute for that described contract specifications, the first question which must be answered is whether the item required by the contract can only be obtained by one manufacturer.

If there are at least two manufacturers of the product required by the contract, it would appear that the Material and Workmanship clause of the contract would not be applicable, and that the government would be entitled to strict compliance with its specification.

It should be noted, however, that in one instance the ASBCA has failed to follow this principle and applied the functional equivalence test to a substitute product offered by a contractor even though the contract specification was couched in terms which permitted two suppliers to compete for the required product. In that case, the Board stated that "the thrust of the law is towards an expansion of the competitive frontier, not a contraction" and accordingly did not permit the government to enforce strict compliance with its specification even though the product described was truly not proprietary in nature.

When it appears that a contract specification is unduly restrictive, on occasion and with very little regular success, the government has argued that the mere fact an item had to be specially manufactured (i.e., other firms might be capable of making that product), but was not readily available as a standard production item except from one particular manufacturer, should not trigger the standard of quality provisions of the Material and Workmanship clause.

This argument is difficult to make, however, especially if these other alleged suppliers who "might" manufacture the item required by the specification could only do so with extraordinary effort and cost and it would not be their normal business practice to do so.

To prevent the situation in which the government and the contractor argue whether or not one product is functionally equivalent to another (or worse yet later having a judge decide this very subjective issue), it is important to carefully review contract specifications so that the products required by the government can be supplied by at least two, and preferably three, manufacturers.

If the particular product of one manufacturer is actually what the government needs at a minimum, the contract specification should clearly state this requirement so that the Material and Workmanship clause of the construction contract cannot be used by a contractor to substitute an alternate product. (In this situation, the government could always accept a substitute product offered by the contractor if it is in its best interest to do so with an appropriate adjustment of the contract price).

In any case, it would be prudent to have a contract specification clearly set forth the essential characteristics of the desired product so that if a specification is in fact proprietary, the guidelines are established for the decision maker to apply the functional equivalence test to the alternate product offered by a contractor.

The worst thing for a designer to do is to disguise proprietary requirements in a specification. Such conduct generally leads to a delay in project completion while the parties attempt to determine equality of products and a corresponding increase in contract price.

As one appeals board stated in criticizing an agency's action in this regard, "the government should have candidly indicated the proprietary nature of these specifications and prepared to defend against any protests from potential bidders/suppliers." □

†Ens. Gilmore, John W.
ASCE/Florida Jr. College
to Gulfport, MS

Ens. Hasty, James A.
to Iwakuni, Japan

•†Ens. Jorgeson, Jeffrey D.
BSCE/Cal Poly State
Univ. to Port Hueneme, CA

Ens. Kim, Chung Sik
MEE/Korea Naval
Academy to Korean Navy

†Ltjg. Manning, Cameron A.
BSME/US Naval
Academy to Port
Hueneme, CA

Ens. McCarthy, Kelley T.
BS CHE/Colorado School
of Mines to Sicily, Italy

Ens. Maurer, Claire P.
BS CHE/Texas A&M Univ
to Subic Bay, RP

Ens. Maurer, Gary J.
BSCE/Texas A&M Univ
to Subic Bay, RP

†Ens. Rabe, Christian R.
Malagasy Military
Academy to Malagasy
Army

†Ens. Ramarozatovo, Andriamahandrimanana
Malagasy Military
Academy to Malagasy
Army

•Ltjg. Wilkins, David R.
BS Nav Arch Mar E/
Univ of Michigan
to Little Creek, VA

Ens. Williams, Michael J.
BSME/Univ of New Hampshire to Warmingster, PA

†Ens. Zielinski, Gregory J.
MEOE/Texas A&M Univ
BSCE/Clemson Univ
to Gulfport, MS

Ens. Zurflieh, Christina
BSOE/Florida Inst of Tech
to Guam

Shaky Ground at Naples

By DR. MICHAEL YACHNIS
Chief Engineer, NAVFAC
P. E., D. C., Md., Va.

and

JOSEPH V. TYRRELL
Consultant — Earthquake, Engineers, & Weapons Effects
P. E., Md., Del.

The Navy Hospital and the Naval Support Activity, Naples, Italy, are located in the Agnano area adjacent to Pozzuoli. This area has been experiencing frequent tremors associated with a magmatic intrusion that originated in ancient times. In the period of December 1983 through August 1984, there were 7159 tremors recorded. Most were very small but some strong enough to cause damage.

There were 146 tremors of magnitudes 2.1 to 3.0 on the Richter Scale and 26 between magnitude 3.1 and 3.9. There have been volcanic eruptions at this site in the past, and the present situation holds this possibility although both Italian and U.S. experts conjecture that the probability is small. Earthquakes of tectonic origin, originating on distant faults, have also been strongly felt at the site.

The entire section is known as the Phlagraean Fields (fields of fire). There are thermal springs, steam vents, and spots of boiling mud in several places. Vents in the bay of Pozzuoli called fumaroles were discovered in 1983. The nearest point of the magma is about 2.5 kilometers from the surface. The temperature of the magma is 600 to 800 degrees centigrade.

This condition was created about 36,000 years ago when a huge eruption expelled 80 times as much material as the recent Mount St. Helens event. Since then, eruptions have occurred periodically with the most recent one taking place in 1538. One of the other eruptions has taken place at Solfatara, near the Naval Support Activity (NSA). The Agnano area is itself the cone of an ancient volcano. Mount Vesuvius, located on the opposite side of Naples, is probably associated with the same magmatic intrusion.

The present tremor activity is associated with an uplift of the ground surface which has continued since August 1982. During this period, in addition to the local tremors, at least two moderately large earthquakes caused minor damage at the site. By September 1983, there were many cracks in the major NSA buildings and some housing was so badly damaged that occupants were evacuated. At that time, Joseph V. Tyrrell led a team to investigate the safety of the facilities. Mr. M. Venturino, of the Naval Facilities Engineering Command's (NAVFAC), Western Division (WESTDIV) also participated and additional assistance was provided by Cdr. J. Spagai, ONR, as well as Mr. D. Hill, geologist, and D. Dzurisin, volcanologist, both from the U.S. Geological Survey. At that time, there was no evidence of any structural damage to the main NSA buildings, and the geological community expected the uplift and tremors to end.

In nearby Pozzuoli, damage was wide-spread and more severe. It is estimated that over 500 structures were damaged by September 1983, and the Italian authorities have evacuated over 20,000 people from the area. NAVFAC has made a number of recommendations for improving earthquake safety and further structural investigation of some structures, many of which have been implemented. NAVFAC also arranged to have the Naval Civil Engineering Laboratory (NCEL) install strong motion accelerographs at the site and in two buildings in order to get more information about the effects of the tremors.

The shaking continued in 1984 and damage began to gradually mount. In Pozzuoli some buildings collapsed. The NSA was shaken by some tremors originating very close by and concern for safety increased. Again, NAVFAC dispatched an investigating team in September 1984. The team was led by Dr. M. Yachnis, NAVFAC's Chief Engineer and included Mr. J. V. Tyrrell and Mr. M. Venturino from the 1983 group. NAVFAC's Atlantic Division (LANTDIV) also sent two engineers to assist NSA Public Works in developing details for expedient repair of damage.

In September 1984, there was a small amount of structural damage evident and a lot more non-structural damage than was found a year before. NAVFAC has provided a comprehensive report to CINCUSNAVEUR and NSA Naples including additional recommendations for improving earthquake safety. NAVFAC also arranged for NCEL to check the fundamental period of vibration of some structures using new instruments. By monitoring this period, evidence of structural deterioration can be detected. This program and other actions will help to resolve the concern for safety.

In July 1985, the uplift stopped and tremor activity dropped to a very low level. It appears that the present episode is ending. There was a quiet period of 10 years before 1982. During that period, the uplift experienced in the 1970s was partially reduced by subsidence. This pattern will probably be repeated. While the intense tremors activity is ending, the threat of an earthquake due to tectonic movement on a major fault remains. This latter threat could potentially produce more serious ground motions at the Naval Support Activity.

In October 1985, an onsite inspection by a NAVFAC team reaffirmed the September 1984 conclusions that (1) the tectonic threat necessitates relocation to seismically sound facilities and (2) repairs of damage due to volcanic tremors are necessary for continued occupancy in Agnano. □

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